# Coding Patterns in Swiss Cantonal Cancer Registries (COPRA)
# A Retrospective Assessment

## Master Thesis – Project Report

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## List of abbreviations

| | |
|---|---|
| **CLL** | Chronic Lymphocytic Leukaemia |
| **CRC** | Colorectal cancer |
| **cTNM** | Clinical TNM classification; pre-treatment extent of disease clinically determined |
| **DCO** | Death Certificate Only |
| **ECO** | European Cancer Observatory |
| **EMH** | Extended Mantel-Haenszel chi-square statistics for stratified cross-tabulations |
| **ENCR** | European Network for Cancer Registries |
| **FAB** | French-American-British classification system of acute leukaemia |
| **FOPH** | Federal Office of Public Health |
| **FSO** | Federal Statistical Office |
| **GEKID** | Association of Population-based Cancer Registries in Germany |
| **IACR** | International Association of Cancer Registries |
| **IARC** | International Agency for Research on Cancer |
| **ICD** | International Classification of Diseases |
| **ICD-O** | International Classification of Diseases for Oncology |
| **NCD** | NICER Core Dataset |
| **NHL** | Non-Hodgkin lymphoma |
| **NICER** | National Institute for Cancer Epidemiology and Registration |
| **PSA** | Prostate-Specific Antigen |
| **pTNM** | Pathological TNM classification; post surgical pathologic determined extent of tumour |
| **SD** | Standard deviation |
| **STATA** | Statistics Software |
| **TNM** | Tumour–Node–Metastasis classification system of the UICC |
| **UICC** | Union for International Cancer Control |
| **WHO** | World Health Organisation |

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## Abstract

### Background

Together with completeness, validity and timeliness, the comparability of the data is considered a core quality criterion for cancer registration and coding. Comparability of the statistics generated for different population groups is indeed essential to their meaningful interpretation in terms of cancer monitoring and control on a national level. Although cancer registries follow standard international recommendations for data collection and coding procedures, comparability of data might be concerned if data are collected in multicentre settings as in the case of Swiss cantonal autonomy and legal heterogeneity.

### Objective

The retrospective assessment of the coding patterns of 13 Swiss cancer registries has the purpose of assessing potential variations in coding of eight defined outcome variables for five diagnosed tumour sites during 2008 to 2012.

### Methods

The coding patterns of Swiss cancer registries were assessed by using information from the database of the National Institute for Cancer Epidemiology and Registration (NICER) as at March 2015. Up to 2015, the NICER core dataset comprised registration data on two levels. Level 1 data were provided by all registries to enable nationwide basic incidence statistics. Level 2 data, which enable survival analysis and in-depth incidence statistics, were not mandatory and only provided by a subset of registries. Potential variations in coding of the outcome variables topography, morphology, basis of diagnosis, mode of detection, stage, grading, date of diagnosis and treatment data were analysed for the tumour sites colorectal, breast, prostate, urinary bladder and haematological system. The variations of the outcome variables across the registration units were examined using contingency tables and chi-square statistics, while controlling for sex, age, year of diagnosis and – where indicated – for screening programme and mode of detection.

### Results

*Results of the analyses by age of patients at diagnosis* reveal that cases of patients aged 85+ were rather non-specifically coded. This age gradient in coding of topography, morphology, histological grade and detection method was observed for sites colorectal, breast, prostate and urinary bladder. *Results of the analyses by year of diagnosis* reveal that proportions of non-specific coding of topography decreased steadily for urinary bladder and for breast cancer during 2008-12 and 2008-11, respectively. Non-specific coding of detection mode also decreased strongly for all tumour sites, although for colorectal and breast cancer only until 2011. An improvement in coding of the variables topography (level 1) and first method of tumour detection (level 2) during 2008-11 can be inferred from this pattern. *Results of the analyses of the variable date of diagnosis* show that the distributions of date of all cancer diagnoses differed moderately between the registries. The observed slight seasonal variation was statistically significant for prostate cancer only. *Average treatment numbers per case* ranged from 0.2 to 1.3 treatments, overall. *Results of the analyses by registration unit* reveal that the distributions of non-specific topography coding differed substantially for urinary bladder and breast cancer between the registries (8-98% and 2-57%, respectively). The overall proportion of non-specific morphology coding for each cancer was extremely low (2-5%). The range of the corresponding frequencies in the registries was also narrow (4-10%). Overall

proportion of non-specific histological grade coding for each cancer was moderate (7-20%). The range of the corresponding frequencies in the registries was moderate to wide (12-65%).

### *Conclusions*

The observed wide range in non-specific coding is only partly attributed to the fact that not all cancer registries could provide data for all outcome variables, as only a subset of level 2 variables was available for certain incidence years, tumour sites and/or cancer registries. Most of the wide range in non-specific coding is probably attributable to inequity in access to source information. However, the observed differences in non-specific coding of the variables topography (level 1) and mode of detection (level 2) for colorectal, breast and urinary bladder cancer are directly attributable to individual coding patterns of registries. However, the observed wide range in non-specific coding of cancers between the registries cannot be solely attributed to differences in coding patterns. At present, also the legal and structural framework of the registries differs, which might lead to different defined responsibilities and based on them to different personnel structures within a registry. However, the variation in coding between the registries is still of interest, as the study results for colorectal, breast and urinary bladder cancer reveal that differences in coding can be directly attributed to individual coding patterns of registries. These study findings strengthen the evidence for heterogeneity in registration and/or coding of Swiss cancer registries, which was already observed in several NICER pilot studies. From 2018 the new national law on cancer registration will consolidate the registration processes, since one of the main objectives of the law is to assure the collection of comparable high quality data in Swiss cancer registries.[1]

# 1 Introduction

## 1.1 Background

Population-based cancer registries are needed to describe the extent and nature of the cancer burden. With emphasis on epidemiology and public health they are an essential part of any rational programme of cancer control. Their data, ranging from etiological research, through primary and secondary prevention to health-care planning and patient care are used to establish public health priorities and target cancer control activities.[2] Such activities are aimed to reduce the incidence, morbidity, and mortality of cancer and to improve the quality of life of patients through a systematic implementation of evidence-based interventions in prevention, early diagnosis and treatment.[3] Therefore, the main objective of cancer registries is to produce statistics on the occurrence of cancer in a particular population and to provide a framework for assessing and controlling the impact of cancer on this population.[2] Statistical analyses of trends in incidence, mortality and survival of cancer types are of general public interest and emphasise the prominent role of cancer registries within public health, clinical policy and cancer research. Trend study findings might suggest substantial changes in patterns of environmental and/or lifestyle risk factors over time and risk differences for example by sex and region.[4,5] Trends in mortality rates are influenced by both incidence and survival, and the effect of cancer control activities on mortality will often be quite delayed. Data on incidence and survival can give a more immediate insight into changes in outcome.[3] As for survival trends, international comparison of registry data revealed differences that are likely attributable to access to early diagnosis and/or optimum treatment. The observed favourable trends in survival were due to a shift to earlier stage at diagnosis and better survival within stage.[6] Screening methods at population level are in favour of early diagnosis. Cancers detected by screening have in general a more favourable stage distribution, and are of smaller size than those detected via symptoms – if the programme is effective, i.e. reduces risk and mortality by preventing late stage cancer.[3,6]

Effective action against cancer can only be implemented with a database as complete as possible. Only a nationwide coverage rate of at least 90%[7,8] for new incidence registration leads to statistical evaluations of sufficient quality as basis for national health policies. Beside completeness, validity and timeliness of data, comparability of cancer registration data is an important quality criterion (for data quality, please see annex 7.3.1). Comparability is essential to the meaningful interpretation of registry data and refers to the extent to which coding and classification procedures of cancer registries adhere to established guidelines.[9,10]

## 1.2 Project starting point

At present in Switzerland, the cancer registration is organised at the cantonal level covering 94% of the population (registries established in 23 out of 26 cantons; missing in Schaffhausen, Schwyz and Solothurn).[7,11] The coverage rate increased from 63% in 2007 to currently 94% due to the initiated legislative process for a national law on cancer registration by the Federal Office of Public Health (FOPH) in 2010.[7,11–13] The entry of law into force can be expected at the earliest for 2018. Coming into force a nationwide coverage will be ensured. The national law builds upon the cantonal registries under new legal basis.[14] Currently each canton has established an institutional structure of its own, but the registries follow international recommendations for data collection procedures, contents and coding. Further, the registries follow the recommendations for data collection and coding of the National Institute for Cancer Epidemi-

ology and Registration (NICER). NICER emerged in 2007 from the Swiss Association of Cancer Registries, which was founded in 1978 to harmonise data collection, create an intercantonal database and promote research on cancer epidemiology at national level.[15,16]

NICER compiles and aggregates data collected by the cancer registries according to the NICER Core Dataset (NCD). The NCD represents a list of variables to ensure that standard, comprehensive, and appropriate information is collected to allow valid national cancer monitoring and control. Subject to NCD the following primary sources of ***internationally based cancer coding standards*** are required: coding criteria as defined in the International Classification of Diseases (ICD-10), the ICD for Oncology (ICD-O-3), the Tumour–Node–Metastasis (TNM) classification system of the Union for International Cancer Control (UICC), and the recommendations established by the International Agency for Research on Cancer (IARC), the European Network for Cancer Registries (ENCR) and the International Association of Cancer Registries (IACR).[17]

Although the registries follow standard international recommendations for data collection and coding procedures, comparability of data might be concerned if data is collected in multicentre settings as in the case of Swiss cantonal autonomy and legal heterogeneity. An IARC study published in 2007 revealed that comparability is affected if differences in classification and coding across registries are observed.[18] Evidence for heterogeneity in registration and/or coding of Swiss cancer registries arises from several NICER pilot studies where substantial variation regarding completeness of case, completeness of follow-up and quality of vital status follow-up has been observed.[19–21] Further, a NICER round robin test from 2014/2015 indicated differences in coding. Sixteen randomly selected cancer cases were chosen from the NICER database for the incidence year 2011. Each registry had to code the cases for a list of items based on original case reports and according to usual practice. The results pointed to coding differences with respect to standardised coding schemes.[22] As a consequence, ***a systematic evaluation of the coding patterns*** taking into account heterogeneity in the underlying population and differences in cantonal screening policies has been suggested. Therefore, ***the focus of this master thesis lies on the comparability of registry data*** (i.e. the assessment of potential variation in coding patterns) and complements the previous NICER pilot studies focusing on completeness issues. Consistent coding of cancer registries allows a higher level of differentiation in the data for analysis, e.g. of trends in distributions of tumours within the same organ or of differences in the histology of a tumour due to changes in expositions (e.g. smoking habit associated with lung cancer, smoking and alcohol associated with oesophageal cancer).[5,23,24] Comparability of data generated for different population groups (and over time) is essential to their meaningful interpretation in terms of nationwide cancer surveillance and control.[9,10] In contrast, non-comparable data due to inconsistent coding might result in misclassification and biased conclusions.

## 1.3 Objective

This master thesis compares coding patterns of 13 Swiss cancer registries for tumour diagnoses covering the years 2008 to 2012. The intention is to identify potential variation in coding, which might affect intercantonal comparability. Specifically, the pattern of coding regarding the NCD variables ***topography, morphology, basis of diagnosis, mode of detection, grade, stage, date of diagnosis and treatment data*** is carefully examined for a subset of five cancer sites: ***colorectal, breast, prostate, urinary bladder and haematological system***. These cancer were chosen a) due to their high incidence (i.e. breast, prostate and

colorectal cancers account for ~40% of all cancer cases worldwide) and b) due to internationally known coding problems in case of urinary bladder cancers and haematological malignancies.[18,25]

## 1.4 Hypothesis and research question

The study approach is descriptive. Descriptive studies are said to be hypothesis-generating – in this case providing details regarding potential variations in coding and their impact on data comparability. Although the systematic evaluation follows the descriptive approach (retrospective assessment), the following working hypothesis is taken:

***There are differences in the pattern of coding among Swiss cancer registries having an impact on intercantonal comparability of the data.***

The research question here is: ***Do Swiss cancer registries show a consistent coding pattern?***

The corresponding null hypothesis implies that under the assumption that a) all registries code consistently and that b) the availability and quality of relevant source information as well as the population within Switzerland are comparable, the distribution of the coded cases should be the same among the registries. Differences in the pattern of coding are not to be observed, e.g. there should be no coding heterogeneity regarding the morphology of a tumour. However, real differences can exist, i.e. based on different risk factors in a population or on disparities in the use of screening programmes such as mammography or colonoscopy. Cantonal reporting sources and the access to these sources also differs between the registries, which might lead to differences in coding. Even if heterogeneity in the pattern of coding might be observed, the quality of informative data such as the distribution of cancer as being of no special morphological cell type coded with 'not otherwise specified' (NOS) should be the same, i.e. at least the proportion of unspecified coding is expected to be the same across all cancer registries.

# 2 Methods

## 2.1 Study design

The analysis is based on an anonymised full sample of all cancer diagnoses of the years 2008 to 2012 extracted from the NICER database as at March 2015. The study approach is descriptive with the objective of providing details regarding potential data comparability issues. The time period under study represents the most up-to-date data basis for a systematic evaluation of the coding patterns of Swiss cancer registries, since NICER was established in 2007. Most recent registry data transmitted to NICER in 2014/2015 include tumour data through 2012, since a two-year delay in incidence reporting is agreed on, due to data checking and validation. The evaluation includes 13 registration units (cantonal and regional cancer registries) with recorded diagnoses during the observation period.[17]

## 2.2 Data sample and cases

The registration units annually transmit an extract from their database to NICER. Tumour data are to be provided for Swiss citizens or foreigners with permit B or C and principal residence in the canton of the corresponding registry at the time of diagnosis. These individual anonymised data are added to the NICER database, which includes all registered tumour cases since each registry was established.[17,26] Up to 2015, the NICER core dataset comprised registration data on two levels (level 1 and level 2) within three categories of epidemiologic information a) personal characteristics, b) cancer characteristics: diagnosis and treatment related, and c) follow-up status.[17,27] Level 1 data are provided by all registries to enable nationwide basic incidence statistics. Level 2 data, which enable survival analysis and in-depth incidence statistics, were only provided by a subset of registries and mandatory for breast and colorectal cancer only, and recommended only for other tumour sites.[28] Thus, the NICER national data differ by registration unit. In addition, only a subset of level 2 variables might be available for certain incidence years, tumour sites and/or cancer registries.[27]

Primary cancer diagnoses of the sites colorectal, breast, prostate, urinary bladder and haematological system represent the basis of analysis. These localisations were chosen due to their high frequency or known coding problems (urinary bladder and haematological system). After a plausibility check of the received anonymised data from NICER, a total number of 71,679 diagnoses from 2008 to 2012 resulted (only four dropouts for breast cancer were identified). Sample sizes for the site-specific analyses are as follows: colorectal n=13,738, breast n=20,804, prostate n=19,836, urinary bladder n=6,902 and haematological system n=10,399.

## 2.3 Variables

### 2.3.1 Outcome variables

The following categorical outcome variables have been chosen as indicators (data levels indicated):

- Topography (level 1)
- Morphology (level 1)
- Basis of diagnosis (level 1)
- Mode of detection (level 2)
- Grade (level 2)

- TNM stage information (level 2)
- Date of diagnosis, i.e. month of incidence (level 1)
- Treatment data as binary information labelled yes/no (level 2)

Most important for cancer statistics is the coding of the tumour (topography, morphology and basis of diagnosis) using the ICD-O-3, and the coding of stage, using the Tumour–Node–Metastasis (TNM) classification system of the UICC.[29] The below-mentioned description of the outcome variables is according to the NICER core dataset[17], ENCR recommendations for a standard dataset[30] and IARC principles and methods for cancer registration.[31] (For the NCD coding scheme of the outcome variables, please see annex 7.3.2.)

**Topography (site)**

The topography describes the site of origin of a neoplasm (primary site, not the location of any metastasis) based on the best source of information. All cancer diagnoses after incidence year 2003 are coded according to the ICD-O-3 classification. ICD-O-3 is internationally recognised as the definitive classification of neoplasms and consists of two dimensions, which together describe a neoplasm: a) the topography code describes the anatomical site of origin (or organ system) and b) the morphological code describes the cell type (or histology) together with the behaviour (benign, in situ, and malignant).[29] For the site haematological system the topography codes are grouped by the ICD-O-3 chapters. The proportions of extra-nodal lymphomas (not originated from the lymph nodes) and nodal lymphomas (C77) are separately displayed, since at least one quarter of non-Hodgkin lymphomas arise from tissue other than lymph nodes and might have a better prognosis than nodal lymphomas. Whereas the site of origin for leukaemia is summarised under code C42 'hematopoietic and reticuloendothelial system', chronic lymphocytic leukaemia (CLL) might be clinically described and therefore reported as malignant lymphoma with localisation lymph node and recorded using code C77.[25]

**Morphology (histology)**

Morphology describes the microscopic appearance and cellular origin of the primary cancer. In addition, the code includes the assessment of growth behaviour of neoplasms (benign, in situ, and malignant). All cancer diagnoses after incidence year 2003 are coded according to the ICD-O-3 classification. For analysis, the morphology codes of the tumour sites are summarised in categories corresponding to the ICD-O-3 chapter groups.

**Basis of diagnosis**

The most valid basis of diagnosis is of great interest in assessing the quality of registration data. This data item has to be updated if the tumour diagnosis is confirmed by a more valid procedure (irrespective of the point in time after diagnosis at which this procedure takes place). Minimum coding requirement is to follow the recommended ENCR categories into microscopic (cytology, histology of metastasis and histology of primary tumour) and non-microscopic (DCO, clinical, clinical investigation, tumour markers). Death Certificate Only (DCO) refers to cases where the only information comes from a death certificate. Diagnosis made before death are summarised in the category 'clinical' in terms of clinical only, without the benefit of any further investigation. Clinical investigation includes all diagnostic techniques (e.g. X-ray, endoscopy, imaging, ultrasound, exploratory surgery and autopsy, without a tissue diagnosis).[32]

## Mode of detection

The categories for the mode of first detection of a tumour are summarised as follows: tumour symptoms, incidental finding, screening, other mode than already mentioned and unknown mode of detection. The category 'other' mode of detection (code 800) comprises also death without autopsy (code 400) and death with autopsy (code 500). The detailed site-specific screening codes are combined into one screening category per site. However, two additional categories are listed for breast cancer analyses: mammography as opportunistic screening and mammography as systematic screening (within a screening programme). It is important to note that the main NCD code for screening also includes check-ups (code 300 = check-up/screening; further detailed codes provided for specific sites breast/colon/prostate/cervix). Therefore in general, the category 'screening' includes all examinations in symptom-free individuals, site-specific systematic (provided within a programme) and non-systematic (opportunistic) screening. A subdivision in systematic and opportunistic screening is made only for mammography. (For a detailed NCD coding scheme of this outcome variable and its site-specific screening codes, see annex 7.3.2). The method of first detection of tumour is especially important if tumours are screen-detected, since the item is an indicator for the assessment of screening programmes. The type of detection is associated with the tumour stage at diagnosis, e.g. stage of breast cancer is more favourable among those women with tumours detected during a regular screening.[33] In Switzerland, there is no nationwide breast cancer screening programme in place. Almost the half of the Swiss cantons, however, implemented a mammography screening programme: Basel-City, Berne (excluding Bernese Jura), Fribourg, Geneva, Graubuenden, Jura-Neuchatel-Bernese Jura, St. Gallen, Ticino, Thurgau, Vaud and Valais.[34]

## Grading

Grade information includes the extent of differentiation of a tumour, i.e. the assessment of histological grade. Grade X (GX) indicates that the grade cannot be assessed (undetermined grade). If the histological grade was not mentioned in a pathology report, grade 'unknown' has to be recorded. Colorectal cancer (CRC) and urinary bladder cancer are graded as well-differentiated (G1 – low grade), moderately differentiated (G2 – intermediate grade) and poorly differentiated (G3 – high grade). Breast cancer is coded according to the Nottingham Grading System. It consists of tubule formation (how much of the tumour tissue has normal duct structures), nuclear grade (evaluation of the size and shape of the nucleus in the tumour cells) and mitotic rate (how many dividing cells are present, measure of tumour growth). Each of the categories gets a score between 1 and 3. The scores for the categories are then added, resulting in a total score of 3 to 9. Breast cancer is graded as well differentiated with score 3–5 (G1 – low grade), as moderately differentiated with score 6–7 (G2 – intermediate grade) and as poorly differentiated with score 8–9 (G3 – high grade). Prostate cancer is coded according to the Gleason scoring system based on biopsy samples taken from the prostate. A primary and a secondary pattern of tissue organisation are identified and each pattern is given a grade from 1 (looking the most like normal prostate) to 5 (looking the most abnormal). The two grades are added to give the Gleason score. Prostate cancer is graded as well differentiated with Gleason 2-4 (G1 – low grade), as moderately differentiated with Gleason 5-6 (G2 – intermediate grade) and as poorly differentiated or undifferentiated with Gleason 7-10 (G3/4 – high grade).[35] Grade information is irrelevant for most haematological malignancies. It is not applicable with leukaemia and primarily used only for follicular lymphomas according to the WHO classification of lym-

phoid neoplasms. Follicular lymphomas are the most common subtype of B-cell non-Hodgkin lymphomas and usually slow-growing (grades 1-3).[36,37]

## TNM stage information

Information about tumour stage at the time of diagnosis includes the categorisation of the stages of malignancy (extent of invasive or in situ solid tumour growth) based on the TNM staging system of the UICC. Stage is an important item of cancer surveillance and cancer control and an endpoint for the evaluation of the population-based screening and early detection programmes. The **T category** describes the primary tumour site, the **N category** the regional lymph node involvement and the **M category** the absence or presence of metastases. The definition of each category depends on the site and histology of the cancer. However, for all codes suffix 'X' indicates that the primary tumour cannot be assessed. Suffix '0' stands for no indication of primary tumour. The TNM staging system allows tumour classification according to two distinct systems, the clinical ***c*TNM** and pathological ***p*TNM**. The pre-treatment extent of disease is determined clinically, e.g. information from laboratory tests, imaging or biopsy. Detailed post surgical pathologic classification provides additional information obtained from surgical excision and pathological examination of the entire primary tumour. Further, the categories may be grouped together as an *anatomical stage* classification (I – IV), describing the local, regional and distant extent of a cancer.[17,38] In regard to the observation period, the 6th edition (2003) and 7th edition (2010) of the TNM classification of malignant tumours are relevant.[39,40] An important change taking effect with the 7th edition concerns the code MX, which has been deleted from TNM. As the clinical assessment of metastasis can be based on physical examination alone, clinical MX (cMX) is considered as inappropriate. Further, cMX should not be recorded if the pathologist does not have knowledge of the clinical M. The pathological MX (pMX) does not exist as well as pM0 (except at autopsy).[41] At present, the UICC does not propose a TNM classification for haematological malignancies, since it is considered impractical. Because leukaemia starts in the bone marrow and spreads to other organs, there is no need for traditional TNM staging and the 2016 revised WHO classification system of tumours of the haematopoietic and lymphoid tissues is recommended. For Hodgkin lymphoma and non-Hodgkin lymphomas (NHL), the Ann Arbor classification from 1971 is recommended, since no other convincing and tested staging system is available so far.[39,40] The TNM classification is, however, applicable for the tumour sites colorectal, breast, prostate and urinary bladder. The main TNM categories for these four tumour sites are condensed as follows:[39,40]

| Colorectal cancer | Breast cancer |
|---|---|
| **Tis:** carcinoma in situ (non-invasive cancer) | **Tis:** carcinoma in situ (non-invasive cancer) |
| **T1:** invasive tumour infiltrating submucosa | **T1:** invasive tumour with 2 cm or less in diameter |
| **T2:** invasive tumour infiltrating muscularis propria | **T2:** invasive tumour is more than 2 cm but not more than 5 cm |
| **T3:** invasive tumour grown through the muscularis propria into subserosa (the outermost layers of the colon or rectum but not through them) | **T3:** invasive tumour that is larger than 5 cm |
| **T4a:** invasive tumour grown through the serosa (i.e. visceral peritoneum) | **T4:** invasive tumour of any size, growing into the chest wall or skin (including inflammatory breast cancer) |

| | |
|---|---|
| **T4b:** invasive tumour grown through the wall of the colon or rectum and attachment or invasion of nearby tissues or organs | |
| **N1a:** cancer spread in a single nearby lymph nodes | **N1:** cancer spread in a single to 3 axillary lymph nodes and/or internal mammary lymph nodes or both |
| **N1b:** cancer spread in 2 to 3 nearby lymph nodes | **N2:** cancer spread in 4 to 9 axillary lymph nodes or enlarged the internal mammary lymph nodes |
| **N1c:** deposits of cancer cells found in fatty tissues near lymph nodes, but not in the lymph nodes themselves | **N3a**: cancer spread to the infraclavicular lymph nodes |
| **N2a:** cancer spread in 4 to 6 nearby lymph nodes | **N3b**: cancer spread to the infraclavicular lymph nodes and axillary lymph nodes |
| **N2b:** cancer spread in 7 to more nearby lymph nodes | **N3c**: cancer spread to the supraclavicular lymph nodes |
| **M1a:** cancer spread to a single distant organ or distant lymph nodes | **M1:** cancer spread to distant organs |
| **M1b**: cancer spread to more than a single distant organ or distant lymph nodes, or to distant parts of the peritoneum | |
| **Prostate cancer** | **Urinary bladder cancer** |
| **T1:** clinically not recognisable invasive tumour, i.e. incidental finding (not palpable or seen with imaging techniques) | **Tis:** carcinoma in situ (flat tumour) |
| **T2:** invasive tumour palpable with digital rectal exam or seen with imaging techniques, but confined to the prostate | **Ta:** non-invasive papillary carcinoma |
| **T3:** invasive tumour grown outside prostate | **T1:** invasive tumour grown connective tissue (invasive tumour has not grown into the muscle layer) |
| **T4:** invasive tumour grown into tissues next to prostate | **T2:** invasive tumour grown into the muscle layer |
| | **T3:** invasive tumour grown through the muscle layer into the fatty tissue layer that surrounds it |
| | **T4:** invasive tumour spread beyond the fatty tissue and into nearby organs or structures |
| **N1:** cancer spread in one or more nearby lymph nodes | **N1:** cancer spread in a single lymph node |
| | **N2:** cancer spread in 2 or more lymph nodes |
| | **N3:** cancer spread to lymph nodes along the common iliac artery |
| **M1:** cancer spread beyond nearby lymph nodes | **M1:** cancer spread to distant parts of the body |
| **M1a:** cancer spread to distant lymph nodes | |
| **M1b:** cancer spread to the bones | |
| **M1c:** cancer spread to other organs | |

**Date of diagnosis (month of incidence)**

Analysing the month of tumour diagnosis could reveal possible seasonal variation in diagnosis and possible effects on survival analyses. Cancer often takes decades from the first mutation to clinical diagnosis. The date of the first event to occur (out of six ordered by declining priority) should be chosen as month of incidence. This counts as the actual date when the disease became incident, from which survival is measured.[9]

**Treatment data**

The description of a patient's primary to fifth treatment will be analysed as binary information labelled yes and no. The proportion of diagnoses with and without treatment information is indicated separately for each registry. Treatment information always refers to the number of cases with "maximum" counting, e.g. the proportion of "1st treatment" includes only diagnoses with information on first treatment, but "2nd treatment" refers to information on first and second treatment, and "3rd treatment" to information on first, second and third treatment. Therefore, the proportion of cases with at least two treatments corresponds to the sum of the proportions from "2nd treatment" to "5th treatment".

### 2.3.2 Independent variable

The registration units are pseudo-anonymised for analysis (for the author it is not apparent which data was collected by which registry). The following 13 registration units represent the categorical independent variable and provided data on level 1 or level 2:[27]

- Basel-City and Country (level 1 data)
- Fribourg (level 2 data)
- Geneva (level 2 data)
- Graubuenden and Glarus (level 2 data)
- Jura (level 1 data)
- Lucerne/Nidwalden/Obwalden/Uri (level 2 data)
- Neuchatel (level 1 data)
- St. Gallen and Appenzell (level 2 data)
- Ticino (level 2 data)
- Vaud (level 1 data)
- Valais (level 2 data)
- Zug (level 2 data)
- Zurich (level 2 data)

### 2.3.3 Covariates

The following covariates are possibly predictive of the outcome and are taken into account for the evaluation:

- Tumour site: breast, colorectal, prostate, haematological system and urinary bladder (stratified analysis of outcome variables by tumour site)
- Age at diagnosis (in 5 years categories: <55, 55-64, 65-74, 75-84, 85+)
- Sex (male, female)
- Year of diagnosis (2008, 2009, 2010, 2011, 2012)
- Cantonal mammography screening programme (binary labelled yes/no)
- Mode of detection: also defined as an outcome variable, but the distribution of the outcome variables morphology, grade and stage might vary depending on the mode of detection.

## 2.4 Statistical methods

Tumour site specific analyses are carried out with the statistics software Stata 12. The retrospective assessment follows a descriptive approach. As a result, frequency counts and cross-tabulating of the categorical variables in contingency tables (two-way and multi-way tables including marginal totals and percentages) represent the basis of the systematic evaluation. Pearson chi-square ($\chi^2$) as measure of association for contingency tables between variables of which one or both have more than two possible values is performed to test the relationship between the variables. It is based on a test statistic that measures the divergence of the observed from the expected values under the null hypothesis of no association. The null hypothesis is valid if the $\chi^2$ values are below the percentage points of the $\chi^2$ distribution for P-value = 0.05 of the critical values table. [42]

Extended Mantel-Haenszel chi-square statistics for stratified cross-tabulations (EMH $\chi^2$) is performed to compare the distribution of categorical outcome variables across the registration units while controlling for age, sex and year of diagnosis. Considering the outcome variables morphology, grade and stage, the EMH $\chi^2$ also includes the covariate mode of detection. Regarding tumour site breast, the EMH $\chi^2$ additionally controls for mammography screening (yes/no). Since the outcome and independent variables are nominal, the EMH $\chi^2$ is performed as general association statistic (the most general form of association for categorical variables). Computing EMH $\chi^2$ involves inverting a pooled covariance matrix. The matrix might be singular when requesting the general association statistic for a dataset with many levels of row and column variables and/or with a substantial amount of missing data. Whenever this applies, the categories of the outcome variables are appropriately collapsed in order to perform the EMH $\chi^2$ statistics.[42,43]

The NCD includes for its list of variables, where appropriate, the code ‘unknown’, i.e. a variable value is coded as ‘unknown’ if no information on this variable is available within a diagnosis (= case). For the analyses, tumour site specific missing data are also added to this category. Therefore in general, this category includes all cases without precise information due to missing coding information within a case or missing case data at all.

# 3 Results

The master thesis project includes 71,679 registered primary cancer diagnoses of 13 registration units for the years 2008 to 2012. Case numbers per diagnosis are as follows (Table 3): ***a)*** 13,738 colorectal cancer (19%), ***b)*** 20,804 breast cancer (29%), ***c)*** 19,836 prostate cancer (28%), ***d)*** 6,902 urinary bladder cancer (10%) and ***e)*** 10,399 haematological malignancies (14%).

The results are presented in ascending order of the ICD-10 codes (C18: colorectal, C50: breast, C61: prostate, C67: urinary bladder, C81: haematological system). The analyses for colorectal cancer are discussed in detail and focus on the main findings for each outcome variable by sex, age, year of diagnosis and registration unit. The results for the remaining sites are presented in tables only for the variations by registration unit. Paying attention to completeness and transparency issues, results presented only in written form are illustrated as supplementary table material (annex 7.3.3 – 7.3.6). Results of the outcome variable TNM stage are presented according to the two systems of clinical and pathological TNM. First, the cTNM and pTNM categories are discussed by sex, age and year of diagnosis, and then their distribution by registration unit. Since the definition of each category depends on the site and histology of a cancer, codes listed in neither the 6th nor the 7th TNM edition of the UICC classification of malignant tumours are defined as wrong coding. Wrong coding by the registration units is highlighted in red in the tables. Age is specified in years and refers to age at diagnosis. In the text, percent values are specified without decimal notation; except when slight differences have to be reported (indicated to one decimal point).

## 3.1 Study population

The study population of 71,679 patients comprised 38,734 males (54%) and 32,945 females (46%) with an overall median age of 68.4 years and a mean age of 67.3 years (table 1). Male patients were on average 69.1 years old and female patients 65.1. Females with invasive urinary bladder cancer were the oldest (74.5 years), while those with breast cancer in situ were the youngest (59.2 years). Males outnumbered females for the sites colorectal (56% vs. 44%), urinary bladder (77% vs. 23%) and haematological system (55% vs. 45%). The proportions of the sites breast (99%) and prostate (100%) were sex-specific.

Across all cancer **registration units (a-m)**, the mean age varied from 65.7 to 68.2 years and the median age from 66.2 to 70.3 years (table 2). Male patients outnumbered females in all but one registry (unit e). The sex distribution varied from 49% to 61% for males and from 39% to 51% for females. It was the most unbalanced in **unit g** (61% vs. 39%) and almost balanced in **unit m** (50.3% vs. 49.7%). All but three registries (units a, b and h) had records for the entire period under study (2008-12). **Unit i** registered the most diagnoses over all tumour sites (n=19,604; table 3). **Unit a** had records only for the year 2012 and therefore the smallest case number (n=720). **Unit b** registered 3,590 diagnoses during 2010-12, which corresponds to a substantial number of cases compared to registries providing records over the complete observation period of five years. Cancer **registries a and b** have obviously been established later than in other cantons and therefore cannot cover the entire period under study. **Unit h** registered diagnoses during 2008-10 (n=3,729: tables 2-3). Most probably, this registry did not transmit its current data to NICER in 2014/2015, i.e. the delay in reporting to NICER covers more than two years.

All registration units had records for all tumour sites (Table 3). Eight registries (units b, d, e, h, i, k, l and m) registered most frequently breast cancer diagnoses (29-32%) and the remaining five (units a, c, f, g and j) prostate cancer diagnoses (30-36%). Urinary bladder was the least frequently recorded site in all

registries (6-11%). The proportions of prostate cancer varied the most across the registries, followed by breast cancer, colorectal cancer and urinary bladder cancer. More precisely, **unit g** recorded the most prostate cancer cases (36%) and unit **e** the fewest (23%). Breast cancer registrations were the highest in unit **e** (32%) and the lowest in **unit g** (24%). **Unit l** had the most colorectal cancer cases (23%) and **unit g** the fewest (17%). Urinary bladder cancer registrations were the highest in **unit b** (11%) and the lowest in **unit k** (6%).

Proportions of in situ cancer were reported for all applicable tumour sites (table 4). Urinary bladder cancer in situ was the most frequently recorded (45%), followed by breast cancer in situ (8%), colorectal cancer in situ (2.5%) and prostate cancer in situ (<1%). Apart from **registries d, k and l**, the remaining units had records of in situ cancers, although not for all tumour sites. Only **registries b, c and f** provided information on in situ cancers for all applicable sites. Whereas the proportions of breast cancer in situ varied in a narrow range of 7-11% between the registries, the proportions of urinary bladder cancer in situ varied in a wide range of 7-60%. It is noteworthy that **units d, k and l** cover cantons with mammography screening programme (units a, c, d, f, g, j, k, l, m) during the registries' observation period. These three registries should at least provide information on breast cancer in situ. However, providing NICER with information on in situ cancers was not mandatory during the time period under study.

Table 1: Description of study population by cancer site (n=71,679)

| Cancer site | male | | | | | female | | | | | overall | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | %[1] | mean age | SD | median age | n | %[1] | mean age | SD | median age | n | mean age | SD | median age |
| Total | 38,734 | 54.0 | 69.1 | 12.3 | 69.6 | 32,945 | 46.0 | 65.1 | 15.2 | 66.3 | 71,679 | 67.3 | 13.8 | 68.4 |
| **Colorectal** | **7,701** | **56.1** | **69.8** | **12.1** | **70.9** | **6,037** | **43.9** | **71.0** | **14.2** | **73.1** | **13,738** | **70.3** | **13.1** | **71.7** |
| Invasive | 7,497 | 56.0 | 69.9 | 12.1 | 71.0 | 5,899 | 44.0 | 71.1 | 14.2 | 73.3 | 13,396 | 70.4 | 13.1 | 71.9 |
| In situ | 204 | 59.6 | 67.1 | 11.6 | 67.9 | 138 | 40.4 | 66.9 | 11.9 | 67.2 | 342 | 67.0 | 11.7 | 67.7 |
| **Breast** | **150** | **0.7** | **69.3** | **13.3** | **70.8** | **20,654** | **99.3** | **62.6** | **14.0** | **63.1** | **20,804** | **62.7** | **14.1** | **63.2** |
| Invasive | 143 | 0.8 | 69.5 | 12.9 | 71.0 | 18,956 | 99.2 | 63.0 | 14.2 | 63.5 | 19,099 | 63.0 | 14.2 | 63.5 |
| In situ | 7 | 0.4 | 61.8 | 18.9 | 69.1 | 1,698 | 99.6 | 59.2 | 11.6 | 59.4 | 1,705 | 59.2 | 11.6 | 59.5 |
| **Prostate** | **19,836** | **100.0** | **69.8** | **9.3** | **69.1** | **-** | **-** | **-** | **-** | **-** | **19,836** | **69.8** | **9.3** | **69.1** |
| Invasive | 19,709 | 100.0 | 69.8 | 9.3 | 69.2 | - | - | - | - | - | 19,709 | 69.8 | 9.3 | 69.2 |
| In situ | 127 | 100.0 | 67.6 | 7.5 | 67.3 | - | - | - | - | - | 127 | 67.6 | 7.5 | 67.3 |
| **Urinary bladder** | **5,313** | **77.0** | **71.5** | **11.5** | **72.6** | **1,589** | **23.0** | **72.4** | **12.3** | **73.6** | **6,902** | **71.7** | **11.7** | **72.8** |
| Invasive | 2,854 | 75.6 | 72.9 | 11.1 | 73.7 | 923 | 24.4 | 74.5 | 12.0 | 76.2 | 3,777 | 73.3 | 11.3 | 74.3 |
| In situ | 2,459 | 78.7 | 70.0 | 11.9 | 71.4 | 666 | 21.3 | 69.5 | 12.2 | 70.4 | 3,125 | 69.9 | 11.9 | 71.1 |
| **Haematological system** | **5,734** | **55.1** | **63.5** | **19.0** | **67.7** | **4,665** | **44.9** | **66.0** | **18.7** | **70.1** | **10,399** | **64.7** | **18.9** | **68.7** |

[1] row percentage

Table 2: Distribution of study population by registration unit (n=71,679)

| Registration unit | obs. period | male | | | | | female | | | | | overall | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n | %[1] | mean age | SD | median age | n | %[1] | mean age | SD | median age | n | mean age | SD | median age |
| a | 2012 | 400 | 56.3 | 69.2 | 10.6 | 65.4 | 310 | 43.7 | 65.8 | 14.2 | 74.9 | 710 | 67.7 | 12.4 | 68.2 |
| b | 2010 - 2012 | 1,970 | 54.9 | 70.2 | 12.5 | 69.0 | 1,620 | 45.1 | 65.3 | 14.9 | 69.0 | 3,590 | 68.0 | 13.8 | 69.0 |
| c | 2008 - 2012 | 2,216 | 57.3 | 68.0 | 12.2 | 65.7 | 1,652 | 42.7 | 62.6 | 15.8 | 66.9 | 3,868 | 65.7 | 14.1 | 66.2 |
| d | 2008 - 2012 | 538 | 52.4 | 69.1 | 11.8 | 69.1 | 489 | 47.6 | 67.0 | 14.2 | 69.8 | 1,027 | 68.1 | 13.0 | 69.7 |
| e | 2008 - 2012 | 2,563 | 48.7 | 69.9 | 12.2 | 68.9 | 2,697 | 51.3 | 66.5 | 15.0 | 72.8 | 5,260 | 68.1 | 13.8 | 70.3 |
| f | 2008 - 2012 | 2,880 | 57.3 | 69.0 | 11.9 | 67.8 | 2,143 | 42.7 | 64.7 | 14.4 | 70.2 | 5,023 | 67.2 | 13.2 | 68.4 |
| g | 2008 - 2012 | 2,271 | 60.8 | 69.4 | 11.6 | 68.5 | 1,467 | 39.2 | 66.3 | 14.6 | 71.5 | 3,738 | 68.2 | 12.9 | 69.2 |
| h | 2008 - 2010 | 2,014 | 54.0 | 69.2 | 11.7 | 69.8 | 1,715 | 46.0 | 66.6 | 14.9 | 70.1 | 3,729 | 68.0 | 13.3 | 70.0 |
| i | 2008 - 2012 | 10,515 | 53.6 | 69.0 | 12.6 | 67.7 | 9,089 | 46.4 | 64.9 | 15.0 | 70.0 | 19,604 | 67.1 | 13.9 | 68.7 |
| j | 2008 - 2012 | 4,135 | 57.2 | 69.0 | 12.1 | 65.0 | 3,095 | 42.8 | 65.7 | 14.8 | 69.5 | 7,230 | 67.6 | 13.4 | 67.5 |
| k | 2008 - 2012 | 4,762 | 52.4 | 68.7 | 12.5 | 66.5 | 4,318 | 47.6 | 64.5 | 15.9 | 69.6 | 9,080 | 66.7 | 14.4 | 68.0 |
| l | 2008 - 2012 | 1,202 | 51.7 | 69.7 | 12.8 | 67.6 | 1,125 | 48.3 | 65.5 | 15.8 | 72.9 | 2,327 | 67.7 | 14.5 | 69.3 |
| m | 2008 - 2012 | 3,268 | 50.3 | 69.3 | 12.6 | 69.3 | 3,225 | 49.7 | 64.8 | 15.6 | 69.5 | 6,493 | 67.1 | 14.4 | 69.4 |

[1] row percentage

Table 3: Distribution of cancer site by registration unit (n=71,679)

| Cancer site | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 710 | 3,590 | 3,868 | 1,027 | 5,260 | 5,023 | 3,738 | 3,729 | 19,604 | 7,230 | 9,080 | 2,327 | 6,493 | 71,679 |
| Colorectal (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| (%) | 17.9 | 20.3 | 19.2 | 20.4 | 21.5 | 19.0 | 16.5 | 19.3 | 18.3 | 19.7 | 20.0 | 22.9 | 17.6 | 19.2 |
| Breast (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| (%) | 28.9 | 28.5 | 27.7 | 29.7 | 32.3 | 26.7 | 23.7 | 29.1 | 29.3 | 25.8 | 31.3 | 28.8 | 31.9 | 29.0 |
| Prostate (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 |
| (%) | 31.4 | 26.4 | 30.4 | 28.4 | 23.1 | 29.8 | 35.9 | 28.2 | 26.9 | 29.9 | 28.1 | 24.7 | 23.5 | 27.7 |
| Urinary bladder (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| (%) | 9.6 | 10.9 | 9.6 | 8.1 | 7.2 | 10.8 | 10.5 | 9.9 | 10.7 | 10.2 | 6.2 | 8.6 | 10.8 | 9.6 |
| Haematological system (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| (%) | 12.3 | 14.0 | 13.1 | 13.3 | 15.9 | 13.8 | 13.3 | 13.4 | 14.7 | 14.4 | 14.5 | 15.0 | 16.1 | 14.5 |

(%) column percentage

Table 4: Distribution of cancer invasive and in situ by registration unit (n=71,679)

| Cancer site | Registration unit[1] | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 710 | 3,590 | 3,868 | 1,027 | 5,260 | 5,023 | 3,738 | 3,729 | 19,604 | 7,230 | 9,080 | 2,327 | 6,493 | 71,679 |
| Colorectal (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| Invasive (%) | 100.0 | 98.9 | 90.6 | 100.0 | 100.0 | 83.2 | 100.0 | 100.0 | 97.1 | 100.0 | 100.0 | 100.0 | 100.0 | 97.5 |
| In situ (%) | - | 1.1 | 9.4 | - | - | 16.8 | - | - | 2.9 | - | - | - | - | 2.5 |
| Breast (n) | ***205*** | 1,024 | ***1,073*** | ***305*** | 1,701 | ***1,339*** | ***885*** | 1,087 | 5,739 | ***1,865*** | ***2,840*** | ***670*** | ***2,071*** | 20,804 |
| Invasive (%) | ***91.2*** | 88.9 | ***90.9*** | ***100.0*** | 88.8 | ***89.2*** | ***90.1*** | 92.6 | 90.0 | ***91.3*** | ***100.0*** | ***100.0*** | ***88.7*** | 91.8 |
| In situ (%) | ***8.8*** | 11.1 | ***9.1*** | **-** | 11.2 | ***10.8*** | ***9.9*** | 7.4 | 10.0 | ***8.7*** | **-** | **-** | ***11.3*** | 8.2 |
| Prostate (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 |
| Invasive (%) | 100.0 | 99.7 | 94.0 | 100.0 | 100.0 | 96.4 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 99.4 |
| In situ (%) | - | 0.3 | 6.0 | - | - | 3.6 | - | - | - | - | - | - | - | 0.6 |
| Urinary bladder (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| Invasive (%) | 82.4 | 39.9 | 42.9 | 100.0 | 92.6 | 46.0 | 50.0 | 51.8 | 45.4 | 43.0 | 100.0 | 100.0 | 43.1 | 54.7 |
| In situ (%) | 17.6 | 60.1 | 57.1 | - | 7.4 | 54.0 | 50.0 | 48.2 | 54.6 | 57.0 | - | - | 56.9 | 45.3 |
| Haematological system (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| (%) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

(%) column percentage per total n of tumour site

[1] registration units with mammography screening programme during observation period: ***a, c, d, f, g, j, k, l, m***

### 3.1.1 Colorectal cancer

Patients diagnosed with colorectal cancer (CRC, n=13,738) were on average 70.3 years old, with men on average 69.8 (n=7,701) and women on average 71.0 (n=6,037). The overall median age was 71.7 years (table 1). Patients with invasive CRC were older than those with CRC in situ, with 30% in the age group 75-84, 15% in the age group 85+ and 11% in the age group <55 (table 5). Patients with CRC in situ were in 35% of all cases between 65-74 years old and in 15% younger than 55 years, while only 5% were aged 85+. Invasive CRC diagnoses were recorded in 98% of all cases. Only four units registered CRC in situ (n=342). Invasive CRC registrations were the most frequent in **unit i** (26%), whereas **unit a** had only data for 2012 and, as a consequence, the fewest invasive cases (1%). **Unit f** recorded by far the most in situ diagnoses (47%), while **unit b** had the least (2%). Across all registries, the median age of invasive CRC ranged from 70.5 to 74.0 years and that of CRC in situ from 56.7 to 69.4. The age distribution of patients diagnosed with invasive CRC varied the most in the age group 75-84 (25-34%) and the least in the age group <55 (7-14%). The variation in age of CRC in situ was the most unbalanced for patient aged <55 years (13-38%) and the most balanced for patients aged 55-64 (20-26%).

Table 5: Distribution of colorectal cancer by age group (n=13,738)

| Colorectal cancer | | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Invasive | total (n) | 127 | 720 | 674 | 210 | 1,131 | 793 | 618 | 720 | 3,490 | 1,422 | 1,814 | 533 | 1,144 | 13,396 |
| | median age | 74.0 | 71.9 | 70.5 | 72.6 | 72.5 | 71.4 | 71.4 | 71.6 | 71.8 | 71.5 | 71.8 | 72.4 | 73.3 | 71.9 |
| | <55 (%) | 8.7 | 12.8 | 13.1 | 8.1 | 8.5 | 7.4 | 12.5 | 9.3 | 11.4 | 10.3 | 13.7 | 11.8 | 10.8 | 11.1 |
| | 55-64 (%) | 14.2 | 17.5 | 18.6 | 21.9 | 17.3 | 20.3 | 17.8 | 16.3 | 17.3 | 19.1 | 16.8 | 17.1 | 17.4 | 17.7 |
| | 65-74 (%) | 26.8 | 25.3 | 27.3 | 23.3 | 28.6 | 28.9 | 27.2 | 30.0 | 28.1 | 27.9 | 25.5 | 25.9 | 24.5 | 27.2 |
| | 75-84 (%) | 33.9 | 30.0 | 25.4 | 25.7 | 30.2 | 28.9 | 29.9 | 31.5 | 29.7 | 29.8 | 29.4 | 28.9 | 30.1 | 29.5 |
| | 85+ (%) | 16.5 | 14.4 | 15.7 | 21.0 | 15.5 | 14.5 | 12.6 | 12.9 | 13.6 | 12.9 | 14.6 | 16.3 | 17.2 | 14.5 |
| In situ | total (n) | - | 8 | 70 | - | - | 160 | - | - | 104 | - | - | - | - | 342 |
| | median age | - | 56.7 | 67.2 | - | - | 69.4 | - | - | 67.2 | - | - | - | - | 67.7 |
| | <55 (%) | - | 37.5 | 15.7 | - | - | 12.5 | - | - | 15.4 | - | - | - | - | 14.6 |
| | 55-64 (%) | - | 25.0 | 21.4 | - | - | 20.0 | - | - | 26.0 | - | - | - | - | 22.2 |
| | 65-74 (%) | - | 25.0 | 35.7 | - | - | 35.6 | - | - | 32.7 | - | - | - | - | 34.5 |
| | 75-84 (%) | - | - | 25.7 | - | - | 26.9 | - | - | 20.2 | - | - | - | - | 24.0 |
| | 85+ (%) | - | 12.5 | 1.4 | - | - | 5.0 | - | - | 5.8 | - | - | - | - | 4.7 |

(%) column percentage

### 3.1.2 Breast cancer

The 20,804 patients diagnosed with breast cancer were on average 62.7 years old, with men on average 69.3 (n=150) and women on average 62.6 (n=20,654). The overall median age was 63.2 (table 1). Patients with invasive breast cancer were older (median age = 63.5) than those with breast cancer in situ (median age = 59.5), with proportions of 16% in the age group 75-84, 8% in the age group 85+ and 30% in the age group <55 (table 5). Patients with breast cancer in situ were in 37% of all cases younger than 55 years, a modest 9% were between 65-74 years old and only 1% was aged 85+. Invasive breast cancer diagnoses were registered in 92% of all cases. All but three registries (units d, k and l) had records of in situ cancer (n=1,705). Whereas **unit a** recorded the fewest invasive and in situ cancer diagnoses (both 1%), **unit i** registered the most (27% and 34%, respectively). The median age of invasive breast cancer ranged from 60.1 to 65.5 years between the registries and that of in situ cancer from 55.5 to 61.2. The age distribution of invasive and in situ cancer varied the most for patients aged 65-74 (20-36% and 18-33%, respectively) and the least for patients aged 85+ (5-10% and 1-4%, respectively). Nine registries had records of breast

cancer diagnoses detected within a cantonal mammography programme (table 7). Although **units d, k and l** cover cantons with mammography screening in place, they reported no in situ cases to NICER. In contrast, **registries g and j** also reported in situ cases during their period without cantonal mammography programme, with similar proportions compared to their period with cantonal screening. The differences observed in reporting of breast cancer in situ arise from the variation in reporting arrangements, because the registries were not required to provide NICER with any information on in situ cases during the time period under study (2008-12).

Table 6: Distribution of breast cancer by age group (n=20,804)

| Breast cancer | | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Invasive | total (n) | 187 | 910 | 976 | 305 | 1,511 | 1,194 | 797 | 1,009 | 5,164 | 1,703 | 2,841 | 670 | 1,836 | 19,099 |
| | median age | 65.3 | 63.9 | 60.1 | 64.3 | 64.9 | 62.4 | 65.5 | 65.4 | 63.2 | 64.5 | 62.7 | 63.5 | 63.3 | 63.5 |
| | <55 (%) | 27.8 | 29.2 | 37.3 | 28.5 | 27.0 | 31.1 | 23.5 | 24.9 | 30.7 | 26.3 | 31.7 | 32.8 | 30.2 | 29.8 |
| | 55-64 (%) | 18.2 | 21.2 | 22.4 | 20.0 | 20.7 | 25.0 | 23.3 | 21.2 | 21.0 | 21.7 | 21.8 | 18.4 | 21.7 | 21.5 |
| | 65-74 (%) | 35.8 | 23.2 | 20.4 | 27.9 | 25.4 | 23.9 | 25.6 | 26.1 | 24.8 | 27.8 | 23.7 | 22.1 | 25.8 | 24.8 |
| | 75-84 (%) | 12.8 | 18.2 | 13.6 | 15.1 | 18.0 | 13.8 | 19.2 | 19.2 | 16.7 | 15.9 | 14.8 | 17.0 | 15.3 | 16.2 |
| | 85+ (%) | 5.4 | 8.1 | 6.3 | 8.5 | 9.0 | 6.3 | 8.4 | 8.6 | 6.9 | 8.3 | 8.0 | 9.7 | 7.1 | 7.6 |
| In situ | total (n) | 18 | 114 | 98 | - | 190 | 145 | 88 | 80 | 575 | 162 | - | - | 235 | 1,705 |
| | median age | 57.7 | 57.9 | 59.7 | - | 60.1 | 61.2 | 58.5 | 60.5 | 59.1 | 55.5 | - | - | 61.2 | 59.5 |
| | <55 (%) | 38.9 | 42.1 | 33.7 | - | 32.1 | 35.2 | 34.1 | 36.3 | 38.8 | 45.7 | - | - | 31.9 | 37.0 |
| | 55-64 (%) | 22.2 | 18.4 | 28.6 | - | 27.9 | 26.9 | 33.0 | 26.3 | 24.9 | 25.9 | - | - | 28.1 | 26.2 |
| | 65-74 (%) | 33.3 | 30.7 | 28.6 | - | 24.7 | 31.0 | 18.2 | 25.0 | 25.2 | 21.6 | - | - | 30.2 | 26.3 |
| | 75-84 (%) | 5.6 | 8.8 | 5.1 | - | 13.2 | 6.9 | 11.4 | 12.5 | 9.7 | 6.8 | - | - | 8.9 | 9.3 |
| | 85+ (%) | - | - | 4.1 | - | 2.1 | - | 3.4 | - | 1.4 | - | - | - | 0.9 | 1.2 |

(%) column percentage

Table 7: Distribution of breast cancer within mammography screening programme (n=20,804)

| Breast cancer | Registration unit | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | overall |
| Screening programm since | 2011 | none | 2004 | 2005 | 2015 | 1999 | 2011 | 2014 | none | 2010 | 1999 | 2007 | 1999 | |
| Total (n) 2008 - 2012 | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| **Cases during period "No Screening Programme available"** | | | | | | | | | | | | | | |
| Total (n) | - | 1,024 | - | - | 1,701 | - | 485 | 1,087 | 5,739 | 646 | - | - | - | 10,682 |
| Invasive (%) | - | 88.9 | - | - | 88.8 | - | 89.7 | 92.6 | 90.0 | 93.8 | - | - | - | 90.2 |
| In situ (%) | - | 11.1 | - | - | 11.2 | - | 10.3 | 7.4 | 10.0 | 6.2 | - | - | - | 9.8 |
| **Cases during period "Screening Programme available"** | | | | | | | | | | | | | | |
| Total (n) | 205 | - | 1,073 | 305 | - | 1,339 | 400 | - | - | 1,219 | 2,840 | 670 | 2,071 | 10,122 |
| Invasive (%) | 91.2 | - | 90.9 | 100.0 | - | 89.2 | 90.5 | - | - | 90.0 | 100.0 | 100.0 | 88.7 | 93.5 |
| In situ (%) | 8.8 | - | 9.1 | 0.0 | - | 10.8 | 9.5 | - | - | 10.0 | 0.0 | 0.0 | 11.4 | 6.5 |

(%) column percentage

### 3.1.3 Prostate cancer

The mean age of the 19,836 men with prostate cancer was 69.8 years and the median age 69.1 (table 1). Men with invasive prostate cancer were older (median age = 69.2) than those with in situ diagnoses (median age = 67.3). Invasive prostate cancer diagnoses were registered in 99% of all cases. **Unit i** registered the most (27%) and **unit a** the least cases (1%). The median age of invasive prostate cancer ranged from 67.4 to 70.5 years between the units and that of in situ cancer from 60.8 to 69.0 (table 8). The age distribution of invasive and in situ prostate cancer varied the most in the age group 55-64 years (20-31% and 20-67%, respectively) and the least in the age group <55 years (2-6% and 3-4%, respectively), yet only three units registered in situ cancer (n=127), while **unit c** recorded 55% of all.

Table 8: Distribution of prostate cancer by age group (n=19,836)

| Prostate cancer | | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Invasive | total (n) | 223 | 943 | 1,104 | 292 | 1,215 | 1,442 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,709 |
| | median age | 67.6 | 70.0 | 68.7 | 67.4 | 70.5 | 68.9 | 70.5 | 68.7 | 68.9 | 69.5 | 69.1 | 69.5 | 68.7 | 69.2 |
| | <55 (%) | 5.8 | 3.3 | 4.5 | 5.1 | 3.3 | 3.8 | 2.3 | 3.1 | 3.6 | 3.5 | 3.8 | 2.6 | 5.0 | 3.7 |
| | 55-64 (%) | 26.0 | 20.7 | 22.4 | 31.2 | 20.4 | 21.7 | 22.4 | 24.8 | 23.3 | 21.6 | 24.1 | 25.9 | 25.7 | 23.2 |
| | 65-74 (%) | 41.7 | 40.1 | 46.7 | 39.4 | 41.5 | 42.6 | 41.4 | 43.7 | 43.0 | 42.8 | 40.9 | 39.5 | 38.5 | 42.1 |
| | 75-84 (%) | 21.5 | 23.5 | 21.6 | 17.5 | 26.3 | 23.8 | 27.5 | 22.2 | 21.8 | 24.6 | 23.5 | 21.6 | 22.4 | 23.2 |
| | 85+ (%) | 4.9 | 12.4 | 4.9 | 6.9 | 8.6 | 8.1 | 6.4 | 6.2 | 8.4 | 7.5 | 7.6 | 10.4 | 8.4 | 7.9 |
| In situ | total (n) | - | 3 | 70 | - | - | 54 | - | - | - | - | - | - | - | 127 |
| | median age | - | 60.8 | 69.0 | - | - | 65.8 | - | - | - | - | - | - | - | 67.3 |
| | <55 (%) | - | - | 2.9 | - | - | 3.7 | - | - | - | - | - | - | - | 3.2 |
| | 55-64 (%) | - | 66.7 | 20.0 | - | - | 31.5 | - | - | - | - | - | - | - | 26.0 |
| | 65-74 (%) | - | - | 57.1 | - | - | 50.0 | - | - | - | - | - | - | - | 52.8 |
| | 75-84 (%) | - | 33.3 | 20.0 | - | - | 13.0 | - | - | - | - | - | - | - | 17.3 |
| | 85+ (%) | - | - | - | - | - | 1.9 | - | - | - | - | - | - | - | 0.8 |

(%) column percentage

### 3.1.4 Urinary bladder cancer

The mean age of all 6,902 patients diagnosed with urinary bladder cancer was 71.7 years, 71.5 for the 5,313 males and 72.4 for the 1,589 females, with an overall median age of 72.8 (table 1). Patients diagnoses with invasive urinary bladder cancer were older (median age = 74.3) than those with in situ diagnoses (median age = 71.1). The corresponding overall proportions of the age groups did not substantially differ between invasive and in situ cancers, except for age group 85+ (table 9). Invasive prostate cancer was registered in 55% of all cases. All but three registries (units d, k and l) reported prostate cancer in situ (n=3,125). The proportions of invasive and in situ cancer were the highest in **unit i** (25% and 37%, respectively) and the lowest in **unit a** (2% and <1%, respectively). The median age of invasive prostate cancer ranged from 71.7 to 76.5 years between the registries and that of in situ cancer from 67.8 to 78.8. The age distribution of invasive cancer was the most unbalanced in the age group 85+ (13- 27%) and the most balanced in the age group <55 (2-8%). The variation in age of in situ cancer was the most unbalanced in the age group 75-84 (17-39%) and the most balanced in the age group <55 (from 6-13%).

Table 9: Distribution of urinary bladder cancer by age group (n=6,902)

| Urinary bladder cancer | | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Invasive | total (n) | 56 | 156 | 159 | 83 | 350 | 250 | 197 | 192 | 956 | 317 | 560 | 199 | 302 | 3,777 |
| | median age | 73.9 | 75.6 | 72.2 | 75.2 | 74.4 | 71.7 | 72.5 | 76.5 | 75.3 | 73.5 | 73.6 | 74.7 | 74.6 | 74.3 |
| | <55 (%) | 1.8 | 7.1 | 6.3 | 7.2 | 4.9 | 5.6 | 7.6 | 5.7 | 5.2 | 5.7 | 6.6 | 3.5 | 4.6 | 5.6 |
| | 55-64 (%) | 16.1 | 10.9 | 17.0 | 14.5 | 12.9 | 19.6 | 14.7 | 12.0 | 12.9 | 19.2 | 16.6 | 16.1 | 12.3 | 14.8 |
| | 65-74 (%) | 32.1 | 25.6 | 30.2 | 26.5 | 31.4 | 30.8 | 33.5 | 22.9 | 28.0 | 28.4 | 28.2 | 28.6 | 32.1 | 29.0 |
| | 75-84 (%) | 28.6 | 35.3 | 28.9 | 25.3 | 34.6 | 31.2 | 27.9 | 37.0 | 34.1 | 29.0 | 32.0 | 31.7 | 29.5 | 32.1 |
| | 85+ (%) | 21.4 | 21.2 | 17.6 | 26.5 | 16.3 | 12.8 | 16.2 | 22.4 | 19.8 | 17.7 | 16.6 | 20.1 | 21.5 | 18.6 |
| In situ | total (n) | 12 | 235 | 212 | - | 28 | 293 | 197 | 179 | 1,150 | 420 | - | - | 399 | 3,125 |
| | median age | 70.4 | 73.6 | 67.8 | - | 78.8 | 70.3 | 71.5 | 70.4 | 71.5 | 70.3 | - | - | 70.9 | 71.1 |
| | <55 (%) | 8.3 | 8.1 | 13.2 | - | 10.7 | 9.9 | 10.7 | 6.2 | 10.6 | 10.0 | - | - | 6.0 | 9.6 |
| | 55-64 (%) | 16.7 | 13.6 | 24.5 | - | - | 18.4 | 20.3 | 19.6 | 17.6 | 20.0 | - | - | 20.1 | 18.6 |
| | 65-74 (%) | 41.7 | 29.8 | 29.3 | - | 28.6 | 33.1 | 30.5 | 33.0 | 30.0 | 32.1 | - | - | 33.1 | 31.1 |
| | 75-84 (%) | 16.7 | 37.5 | 24.5 | - | 39.3 | 31.7 | 27.4 | 35.2 | 31.9 | 26.9 | - | - | 28.6 | 30.6 |
| | 85+ (%) | 16.7 | 11.1 | 8.5 | - | 21.4 | 6.8 | 11.2 | 6.2 | 9.9 | 11.0 | - | - | 12.3 | 10.1 |

(%) column percentage

### 3.1.5 Haematological malignancies

Patients diagnosed with haematological malignancies (n=10,399) were on average 64.7 years old, with men on average 63.5 (n=5,734) and women on average 66.0 (n=4,665). The overall median age was 68.7 years (table 1). **Unit i** registered the most diagnoses (28%), while **unit a** had the least (1%; table 10). The age distribution varied the most in the age group <55 (15-27%) and the least in the age group 55-64 (13-19%).

Table 10: Distribution of haematological malignancies by age group (n=10,399)

| Haematological system | | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| | median age | 68.2 | 69.0 | 66.2 | 69.7 | 70.3 | 68.4 | 69.2 | 70.0 | 68.7 | 67.5 | 68.0 | 69.3 | 69.4 | 68.7 |
| | <55 (%) | 24.1 | 19.0 | 26.7 | 15.3 | 21.7 | 21.2 | 19.7 | 20.0 | 24.4 | 24.3 | 25.6 | 24.6 | 23.0 | 23.3 |
| | 55-64 (%) | 16.1 | 18.2 | 16.0 | 18.3 | 14.5 | 16.5 | 18.5 | 17.0 | 14.7 | 17.6 | 14.8 | 13.4 | 15.4 | 15.7 |
| | 65-74 (%) | 24.1 | 24.8 | 28.9 | 25.6 | 24.4 | 27.5 | 23.3 | 22.8 | 24.0 | 24.1 | 24.7 | 24.0 | 22.8 | 24.4 |
| | 75-84 (%) | 25.3 | 27.9 | 20.6 | 29.9 | 28.0 | 24.4 | 26.9 | 29.1 | 25.3 | 22.8 | 23.7 | 26.0 | 25.5 | 25.3 |
| | 85+ (%) | 10.3 | 10.2 | 7.9 | 11.0 | 11.4 | 10.4 | 11.7 | 11.2 | 11.7 | 11.2 | 11.2 | 12.0 | 13.4 | 11.3 |

(%) column percentage

## 3.2 Colorectal cancer – outcome variables

### 3.2.1 Topography, morphology, mode of detection and basis of diagnosis

Table 11 summarises the distribution of the ICD-O-3 ***topography codes*** for CRC (n=13,738) by sex, age group and year of diagnosis. All codes differed only slightly between the sexes (men=7,701 and women=6,037), except for C20.9 'rectum, NOS', which was the most frequently recorded for men (28%) and women (23%; p<0.0001). The assignments of codes C18.0 'caecum', C18.2 'ascending colon' and C18.9 'colon, unspecified' became more frequent with increasing age (from age <55 to age 85+). They rose steadily from 7% to 17%, from 8% to 15% and form 1% to 6%, respectively. In contrast, coding of C18.7 'sigmoid colon' was more common among younger (e.g. 27% in the 55-64 age group) than among older patients (17% in the 85+ age group). This was also the case for C20.9 'rectum, NOS', with 30% in the 55-64 age group and 21% in the 85+ age group. The remaining codes varied less than 3% with age (p<0.0001). All codes hardly varied with increasing year of diagnosis. However, the proportion of non-specific coding using C18.9 'colon, unspecified' doubled to 2% in 2012 (p<0.0001). Code C20.9 'rectum, NOS' is the only topographical code for rectal carcinoma and cannot be considered as non-specific coding. The registration units (table 12) recorded most frequently C20.9 'rectum, NOS' (26%), followed by C18.7 'sigmoid colon' (23%), C18.0 'caecum' (12%) and C18.2 'ascending colon' (12%). The range of the corresponding frequencies in the registries was narrow (4-9%; p<0.0001). Non-specific coding of topography varied from <1% in **units c and f** to 4.5% in **unit b**. The proportions of the codes remained statistically significantly different when controlling for sex, age and year of diagnosis (p<0.00001).

Table 13 presents the ICD-O-3 ***morphology codes*** by sex, age group and year of diagnosis. The sex distribution was slightly in favour of females, except in category 'adenomas/adenocarcinomas' (p<0.0001). Non-specific coding, denoted as 'other, unspecified', was more common among older (e.g. 14% in the age group 85+) than among younger patients (1.0-3.3% in patients younger up to age 84). In contrast, registrations of adenomas and adenocarcinomas decreased from 89% (age <55) to 76% (age 85+). This

pattern suggests that the very elderly were rather non-specifically coded. The remaining morphological codes did not substantially differ between the age groups (p<0.0001). By year of diagnosis, non-specific coding of morphology almost doubled to 4.5% in 2012. All other categories varied slightly with years (p=0.002). Adenomas and adenocarcinomas (87%; table 14) were the most frequently recorded diagnoses and cystic, mucinous and serous neoplasms (9%) the second most, both with a wide range between the registries (70-93% and 4-25%, respectively). Neoplasms assigned to the category 'other, unspecified' were the third most frequent (4%), with the lowest proportion in **unit h** (<1%) and the highest in **unit a** (9%; p<0.0001). The findings remained statistically significant when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.00001). The detection method of adenomas and adenocarcinomas was primarily unknown (48%). They were second most frequently detected following symptoms by the patient (41%) and third most frequently incidentally (6%). Cystic, mucinous and serous neoplasms were primarily symptomatically detected (49%) but also had high proportions of unknown mode of detection (40%), followed by incidental findings (7%; $\chi^2(20) = 704.67$; p<0.0001).

The ***method of first detection of tumour*** represented level 2 information. To provide NICER with such information was not mandatory during the time period under study. **Units d, h, k and l** provided no such information. Therefore, their CRC diagnoses were excluded from the analyses of the distribution of codes ***by registration unit***. The codes varied only slightly by sex (p=0.127; table 15). The proportion of CRC diagnoses with unknown mode of detection varied inconsistently in a narrow range (46-48%) between the age groups. CRC diagnosed following symptoms detected by the patient rose from 39% (age <55) to 44% (age 85+). In contrast, screen-detected CRC cases decreased from 6% (age 55-64) to 2% (age 85+; p<0.0001). The category 'screening' includes all examinations in symptom-free individuals (check-ups, opportunistic screening and systematic screening). The proportion of screen-detected CRC almost tripled to 7% in 2012 (p<0.0001). The proportion of diagnoses with unknown mode of detection fell strongly from 70% to 28% during 2008-11, but increased slightly to 32% in 2012. This finding indicates an improvement in coding (i.e. a more precise coding) of the method of first detection until 2011, which is supported by a more frequent recording of symptomatic detection during 2008-11. Additional analyses of the distribution of detection codes by year of diagnosis for all registration units with high proportions of non-specific coding revealed that **unit a** and **unit b** were responsible for the renewed rise of non-specific coding in 2012 ($\chi^2(8) = 39.07$; p<0.0001). Table 16 summarises the distribution of the detection codes by registration unit. In all but one registry, the most frequently recorded detection code was 'tumour symptoms' (55%), followed by 'unknown mode of detection' (31%), 'incidental finding' (8%) and 'screening' (6%; p<0.0001). **Unit i** had most frequently recorded that the detection method was unknown. As a consequence, non-specific coding of detection method ranged widely from 4% in **unit c** to 58% in **unit i**. The proportion of CRC detected following symptoms by the patient also varied extremely widely between the registries (34-86%). The proportion of the codes remained statistically significantly different when controlling for sex, age and year of diagnosis (p<0.00001).

Table 17 summarises the ***basis of diagnosis codes*** by sex, age group and year of diagnosis. The differences between the sexes were negligible, with 97% of males and 95% of females in the category 'histology of primary tumour' (p<0.0001). Records of 'histology of primary tumour' fell steadily from 99% (age <55) to 85% (age 85+). In contrast, the proportion of the categories 'clinical investigation', 'clinical' and DCO increased with age and primarily in the 85+ age group (p<0.0001). All basis of diagnosis codes differed marginally during the observation period (p<0.0001). However, registrations of the category

'histology of primary tumour' decreased from 97% to 95% during 2008-12. All cancer registries had well differentiated records of the microscopic proportion (cytology, histology of metastasis and histology of primary tumour), since it represents an international quality criterion (table 18). Therefore, the proportion of non-specific coding of basis of diagnosis was extremely low (0.1%; $p<0.0001$). The proportions of codes varied statistically significantly when controlling for sex, age and year of diagnosis ($p<0.00001$).

Table 11: Colorectal cancer: distribution of ICD-O-3 topography codes by sex, age group and year of diagnosis (n=13,738)

| Topography code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| C18.0 Caecum (n) | 824 | 851 | 111 | 222 | 433 | 572 | 337 | 346 | 330 | 341 | 338 | 320 | 1,675 |
| (%) | 10.7 | 14.1 | 7.2 | 9.1 | 11.5 | 14.2 | 17.2 | 12.9 | 12.4 | 12.1 | 12.3 | 11.4 | 12.2 |
| C18.1 Appendix (n) | 141 | 188 | 157 | 71 | 48 | 39 | 14 | 45 | 44 | 62 | 73 | 105 | 329 |
| (%) | 1.8 | 3.1 | 10.2 | 2.9 | 1.3 | 1.0 | 0.7 | 1.7 | 1.7 | 2.2 | 2.7 | 3.8 | 2.4 |
| C18.2 Ascending colon (n) | 809 | 780 | 118 | 207 | 417 | 559 | 288 | 337 | 324 | 320 | 321 | 287 | 1,589 |
| (%) | 10.5 | 12.9 | 7.7 | 8.5 | 11.1 | 13.9 | 14.7 | 12.5 | 12.1 | 11.3 | 11.7 | 10.3 | 11.6 |
| C18.3 Hepatic flexure (n) | 207 | 193 | 29 | 47 | 102 | 137 | 85 | 75 | 74 | 100 | 70 | 81 | 400 |
| (%) | 2.7 | 3.2 | 1.9 | 1.9 | 2.7 | 3.4 | 4.3 | 2.8 | 2.8 | 3.5 | 2.6 | 2.9 | 2.9 |
| C18.4 Transverse colon (n) | 302 | 295 | 51 | 84 | 166 | 186 | 110 | 121 | 127 | 107 | 115 | 127 | 597 |
| (%) | 3.9 | 4.9 | 3.3 | 3.4 | 4.4 | 4.6 | 5.6 | 4.5 | 4.8 | 3.8 | 4.2 | 4.5 | 4.4 |
| C18.5 Splenic flexure (n) | 187 | 126 | 39 | 54 | 88 | 80 | 52 | 59 | 58 | 67 | 68 | 61 | 313 |
| (%) | 2.4 | 2.1 | 2.5 | 2.2 | 2.3 | 2.0 | 2.7 | 2.2 | 2.2 | 2.4 | 2.5 | 2.2 | 2.3 |
| C18.6 Descending colon (n) | 308 | 227 | 72 | 97 | 134 | 161 | 71 | 103 | 109 | 121 | 108 | 94 | 535 |
| (%) | 4.0 | 3.8 | 4.7 | 4.0 | 3.6 | 4.0 | 3.6 | 3.8 | 4.1 | 4.3 | 3.9 | 3.4 | 3.9 |
| C18.7 Sigmoid colon (n) | 1,924 | 1,330 | 343 | 661 | 977 | 949 | 324 | 643 | 666 | 625 | 662 | 658 | 3,254 |
| (%) | 25.0 | 22.0 | 22.3 | 27.0 | 26.0 | 23.5 | 16.6 | 23.9 | 25.0 | 22.1 | 24.1 | 23.5 | 23.7 |
| C18.8 Overlapping lesion (n) | 59 | 44 | 9 | 22 | 27 | 23 | 22 | 12 | 19 | 32 | 16 | 24 | 103 |
| (%) | 0.8 | 0.7 | 0.6 | 0.9 | 0.7 | 0.6 | 1.1 | 0.5 | 0.7 | 1.1 | 0.6 | 0.9 | 0.8 |
| C18.9 Colon, unspecified (n) | 107 | 145 | 12 | 21 | 31 | 79 | 109 | 35 | 47 | 48 | 59 | 63 | 252 |
| (%) | 1.4 | 2.4 | 0.8 | 0.9 | 0.8 | 2.0 | 5.6 | 1.3 | 1.8 | 1.7 | 2.2 | 2.3 | 1.8 |
| C19.9 Rectosigmoid junction (n) | 664 | 476 | 141 | 226 | 321 | 325 | 127 | 240 | 205 | 234 | 217 | 244 | 1,140 |
| (%) | 8.6 | 7.9 | 9.2 | 9.2 | 8.5 | 8.1 | 6.5 | 8.9 | 7.7 | 8.3 | 7.9 | 8.7 | 8.3 |
| C20.9 Rectum, NOS (n) | 2,167 | 1,371 | 451 | 729 | 1,013 | 926 | 419 | 670 | 665 | 769 | 700 | 734 | 3,538 |
| (%) | 28.1 | 22.7 | 29.3 | 29.8 | 26.9 | 22.9 | 21.4 | 24.9 | 24.9 | 27.2 | 25.5 | 26.2 | 25.8 |
| C21.0 Anus, NOS (n) | - | 7 | 3 | 2 | 2 | - | - | 3 | - | 2 | 1 | 1 | 7 |
| (%) | - | 0.1 | 0.2 | 0.1 | 0.1 | - | - | 0.1 | - | 0.1 | 0.0 | 0.0 | 0.1 |
| C21.1 Anal canal (n) | 2 | 2 | 2 | 1 | - | 1 | - | 1 | - | 1 | 1 | 1 | 4 |
| (%) | 0.0 | 0.0 | 0.1 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 |
| C21.8 Overlapping lesion of (n) | - | 2.0 | - | 1 | 1 | - | - | - | 1 | - | 1 | - | 2 |
| rectum, anus and anal canal (%) | - | 0.0 | - | 0.0 | 0.0 | - | - | - | 0.0 | - | 0.0 | - | 0.0 |

(%) column percentage

Sex: Pearson chi2(11) = 154.90, p<0.0001 Age: Pearson chi2(56) = 1.1e+03, p<0.0001 Year: Pearson chi2(56) = 1.1e+03, p<0.0001

Table 12: Colorectal cancer: distribution of ICD-O-3 topography codes by registration unit (n=13,738)

| Topography code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| C18.0 Caecum (n) | 18 | 88 | 92 | 29 | 126 | 114 | 73 | 102 | 411 | 168 | 226 | 82 | 146 | 1,675 |
| (%) | 14.2 | 12.1 | 12.4 | 13.8 | 11.1 | 12.0 | 11.8 | 14.2 | 11.4 | 11.8 | 12.5 | 15.4 | 12.8 | 12.2 |
| C18.1 Appendix (n) | 4 | 32 | 19 | 5 | 17 | 13 | 18 | 15 | 94 | 30 | 35 | 15 | 32 | 329 |
| (%) | 3.2 | 4.4 | 2.6 | 2.4 | 1.5 | 1.4 | 2.9 | 2.1 | 2.6 | 2.1 | 1.9 | 2.8 | 2.8 | 2.4 |
| C18.2 Ascending colon (n) | 10 | 74 | 61 | 18 | 192 | 108 | 56 | 83 | 453 | 135 | 222 | 58 | 119 | 1,589 |
| (%) | 7.9 | 10.2 | 8.2 | 8.6 | 17.0 | 11.3 | 9.1 | 11.5 | 12.6 | 9.5 | 12.2 | 10.9 | 10.4 | 11.6 |
| C18.3 Hepatic flexure (n) | 3 | 16 | 24 | 6 | 30 | 36 | 21 | 14 | 97 | 36 | 54 | 20 | 43 | 400 |
| (%) | 2.4 | 2.2 | 3.2 | 2.9 | 2.7 | 3.8 | 3.4 | 1.9 | 2.7 | 2.5 | 3.0 | 3.8 | 3.8 | 2.9 |
| C18.4 Transverse colon (n) | 4 | 19 | 27 | 11 | 61 | 42 | 25 | 37 | 160 | 63 | 71 | 30 | 47 | 597 |
| (%) | 3.2 | 2.6 | 3.6 | 5.2 | 5.4 | 4.4 | 4.1 | 5.1 | 4.5 | 4.4 | 3.9 | 5.6 | 4.1 | 4.4 |
| C18.5 Splenic flexure (n) | 3 | 12 | 22 | 6 | 38 | 20 | 15 | 16 | 66 | 29 | 48 | 17 | 21 | 313 |
| (%) | 2.4 | 1.7 | 3.0 | 2.9 | 3.4 | 2.1 | 2.4 | 2.2 | 1.8 | 2.0 | 2.7 | 3.2 | 1.8 | 2.3 |
| C18.6 Descending colon (n) | 2 | 29 | 17 | 12 | 51 | 49 | 25 | 17 | 138 | 51 | 62 | 18 | 64 | 535 |
| (%) | 1.6 | 4.0 | 2.3 | 5.7 | 4.5 | 5.1 | 4.1 | 2.4 | 3.8 | 3.6 | 3.4 | 3.4 | 5.6 | 3.9 |
| C18.7 Sigmoid colon (n) | 29 | 155 | 189 | 46 | 247 | 276 | 147 | 148 | 855 | 324 | 439 | 107 | 292 | 3,254 |
| (%) | 22.8 | 21.3 | 25.4 | 21.9 | 21.8 | 29.0 | 23.8 | 20.6 | 23.8 | 22.8 | 24.2 | 20.1 | 25.5 | 23.7 |
| C18.8 Overlapping lesion (n) | 1 | 13 | 22 | 2 | 5 | 1 | - | 8 | 9 | 32 | - | 2 | 8 | 103 |
| (%) | 0.8 | 1.8 | 3.0 | 1.0 | 0.4 | 0.1 | - | 1.1 | 0.3 | 2.3 | - | 0.4 | 0.7 | 0.8 |
| C18.9 Colon, unspecified (n) | 3 | 33 | 7 | 3 | 14 | 8 | 12 | 7 | 74 | 22 | 39 | 7 | 23 | 252 |
| (%) | 2.4 | 4.5 | 0.9 | 1.4 | 1.2 | 0.8 | 1.9 | 1.0 | 2.1 | 1.6 | 2.2 | 1.3 | 2.0 | 1.8 |
| C19.9 Rectosigmoid junction (n) | 11 | 53 | 85 | 18 | - | 51 | 48 | 85 | 330 | 144 | 169 | 52 | 94 | 1,140 |
| (%) | 8.7 | 7.3 | 11.4 | 8.6 | - | 5.4 | 7.8 | 11.8 | 9.2 | 10.1 | 9.3 | 9.8 | 8.2 | 8.3 |
| C20.9 Rectum, NOS (n) | 39 | 198 | 178 | 54 | 350 | 229 | 178 | 188 | 907 | 388 | 449 | 125 | 255 | 3,538 |
| (%) | 30.7 | 27.2 | 23.9 | 25.7 | 31.0 | 24.0 | 28.8 | 26.1 | 25.2 | 27.3 | 24.8 | 23.5 | 22.3 | 25.8 |
| C21.0 Anus, NOS (n) | - | 4 | 1 | - | - | 2 | - | - | - | - | - | - | - | 7 |
| (%) | - | 0.6 | 0.1 | - | - | 0.2 | - | - | - | - | - | - | - | 0.1 |
| C21.1 Anal canal (n) | - | 1 | - | - | - | 3 | - | - | - | - | - | - | - | 4 |
| (%) | - | 0.1 | - | - | - | 0.3 | - | - | - | - | - | - | - | 0.0 |
| C21.8 Overlapping lesion of (n) | - | 1 | - | - | - | 1 | - | - | - | - | - | - | - | 2 |
| rectum, anus and anal canal (%) | - | 0.1 | - | - | - | 0.1 | - | - | - | - | - | - | - | 0.0 |

(%) column percentage

Pearson chi2(168) = 632.22, p<0.0001 EMH chi2(132) = 511.88, p<0.00001 (collapsed categories: C.20.9, C21.0, C21.1, C21.8)

Table 13: Colorectal cancer: distribution of ICD-O-3 morphology codes by sex, age group and year of diagnosis (n=13,738)

| Morphology code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| Squamous cell neoplasms (n) | 8 | 27 | 6 | 12 | 6 | 9 | 2 | 6 | 7 | 8 | 10 | 4 | 35 |
| (%) | 0.1 | 0.5 | 0.4 | 0.5 | 0.2 | 0.2 | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.1 | 0.3 |
| Adenomas / adenocarcinomas (n) | 6,806 | 5,101 | 1,368 | 2,208 | 3,371 | 3,467 | 1,493 | 2,339 | 2,318 | 2,411 | 2,387 | 2,452 | 11,907 |
| (%) | 88.4 | 84.5 | 89.0 | 90.3 | 89.7 | 85.9 | 76.3 | 87.0 | 86.9 | 85.2 | 86.8 | 87.6 | 86.7 |
| Cystic, mucinous and serous (n) | 667 | 581 | 142 | 189 | 319 | 415 | 183 | 268 | 252 | 289 | 230 | 209 | 1,248 |
| neoplasms (%) | 8.7 | 9.6 | 9.2 | 7.7 | 8.5 | 10.3 | 9.4 | 10.0 | 9.4 | 10.2 | 8.4 | 7.5 | 9.1 |
| Ductal, lobular and medullary (n) | 2 | 16 | 3 | 3 | - | 7 | 5 | 3 | 2 | 4 | 5 | 4 | 18 |
| neoplasms (%) | 0.0 | 0.3 | 0.2 | 0.1 | - | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| Other, specified (n) | 16 | 13 | 4 | 7 | 5 | 7 | 6 | 8 | 6 | 4 | 6 | 5 | 29 |
| (%) | 0.2 | 0.2 | 0.3 | 0.3 | 0.1 | 0.2 | 0.3 | 0.3 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 |
| Other, unspecified (n) | 202 | 299 | 15 | 26 | 59 | 132 | 269 | 66 | 84 | 113 | 112 | 126 | 501 |
| (%) | 2.6 | 5.0 | 1.0 | 1.1 | 1.6 | 3.3 | 13.7 | 2.5 | 3.2 | 4.0 | 4.1 | 4.5 | 3.7 |

(%) column percentage

Sex: Pearson chi2(5) = 90.14, p<0.0001 Age: Pearson chi2(20) = 735.07, p<0.0001 Year: Pearson chi2(20) = 43.46, p=0.002

Table 14: Colorectal cancer: distribution of ICD-O-3 morphology codes by registration unit (n=13,738)

| Morphology code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| Squamous cell neoplasms (n) | - | 9 | 2 | - | 2 | 8 | 1 | - | 2 | 2 | 6 | - | 3 | 35 |
| (%) | - | 1.2 | 0.3 | - | 0.2 | 0.8 | 0.2 | - | 0.1 | 0.1 | 0.3 | - | 0.3 | 0.3 |
| Adenomas / adenocarcinomas (n) | 98 | 617 | 662 | 179 | 1,003 | 668 | 508 | 623 | 3,342 | 1,205 | 1,581 | 450 | 971 | 11,907 |
| (%) | 77.2 | 84.8 | 89.0 | 85.2 | 88.7 | 70.1 | 82.2 | 86.5 | 93.0 | 84.7 | 87.2 | 84.4 | 84.9 | 86.7 |
| Cystic, mucinous and serous (n) | 18 | 39 | 45 | 21 | 87 | 241 | 80 | 89 | 125 | 160 | 180 | 55 | 108 | 1,248 |
| neoplasms (%) | 14.2 | 5.4 | 6.1 | 10.0 | 7.7 | 25.3 | 12.9 | 12.4 | 3.5 | 11.3 | 9.9 | 10.3 | 9.4 | 9.1 |
| Ductal, lobular and medullary (n) | - | 1 | - | 1 | - | - | - | 3 | 1 | 6 | - | - | 6 | 18 |
| neoplasms (%) | - | 0.1 | - | 0.5 | - | - | - | 0.4 | 0.0 | 0.4 | - | - | 0.5 | 0.1 |
| Other, specified (n) | - | - | 4 | - | - | 2 | 2 | 3 | 3 | 4 | 3 | 1 | 5 | 29 |
| (%) | - | - | 0.5 | - | - | 0.2 | 0.3 | 0.4 | 0.1 | 0.3 | 0.2 | 0.2 | 0.4 | 0.2 |
| Other, unspecified (n) | 11 | 62 | 31 | 9 | 37 | 34 | 27 | 2 | 121 | 45 | 44 | 27 | 51 | 501 |
| (%) | 8.7 | 8.5 | 4.2 | 4.3 | 3.3 | 3.6 | 4.4 | 0.3 | 3.4 | 3.2 | 2.4 | 5.1 | 4.5 | 3.7 |

(%) column percentage

Pearson chi2(60) = 705.47, p<0.0001 EMH chi2(60) = 651.44, p<0.00001

Table 15: Colorectal cancer: method of 1st detection of tumour by sex, age group and year of diagnosis (n=13,738)

| Detection | Sex | | Age goup in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| Symptoms (n) | 3,208 | 2,536 | 606 | 1,039 | 1,547 | 1,695 | 857 | 646 | 880 | 1,152 | 1,574 | 1,492 | 5,744 |
| (%) | 41.7 | 42.0 | 39.4 | 42.5 | 41.1 | 42.0 | 43.8 | 24.0 | 33.0 | 40.7 | 57.2 | 53.3 | 41.8 |
| Incidental (n) | 453 | 354 | 116 | 127 | 206 | 246 | 112 | 100 | 139 | 149 | 225 | 194 | 807 |
| (%) | 5.9 | 5.9 | 7.5 | 5.2 | 5.5 | 6.1 | 5.7 | 3.7 | 5.2 | 5.3 | 8.2 | 6.9 | 5.9 |
| Screening (n) | 389 | 247 | 69 | 151 | 224 | 153 | 39 | 67 | 106 | 133 | 139 | 191 | 636 |
| (%) | 5.1 | 4.1 | 4.5 | 6.2 | 6.0 | 3.8 | 2.0 | 2.5 | 4.0 | 4.7 | 5.1 | 6.8 | 4.6 |
| Other (n) | 38 | 32 | 3 | 2 | 11 | 26 | 28 | 2 | 7 | 7 | 31 | 23 | 70 |
| (%) | 0.5 | 0.5 | 0.2 | 0.1 | 0.3 | 0.6 | 1.4 | 0.1 | 0.3 | 0.3 | 1.1 | 0.8 | 0.5 |
| Unknown (n) | 3,613 | 2,868 | 744 | 1,126 | 1,772 | 1,917 | 922 | 1,875 | 1,537 | 1,388 | 781 | 900 | 6,481 |
| (%) | 46.9 | 47.5 | 48.4 | 46.1 | 47.1 | 47.5 | 47.1 | 69.7 | 57.6 | 49.1 | 28.4 | 32.1 | 47.2 |

(%) column percentage

Sex: Pearson chi2(4) = 7.18, p=0.127 Age: Pearson chi2(16) = 128.29, p<0.0001 Year: Pearson chi2(16) = 1.3e+03, p<0.0001

Table 16: Colorectal cancer: method of 1st detection of tumour by registration unit (n=13,738)

| Detection | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 10,461 |
| Symptoms (n) | 61 | 396 | 641 | - | 693 | 765 | 465 | - | 1,226 | 834 | - | - | 663 | 5,744 | 5,744 |
| (%) | 48.0 | 54.4 | 86.2 | - | 61.3 | 80.3 | 75.2 | - | 34.1 | 58.7 | - | - | 58.0 | 41.8 | 54.9 |
| Incidental (n) | 6 | 71 | 26 | - | 49 | 41 | 65 | - | 100 | 159 | - | - | 290 | 807 | 807 |
| (%) | 4.7 | 9.8 | 3.5 | - | 4.3 | 4.3 | 10.5 | - | 2.8 | 11.2 | - | - | 25.4 | 5.9 | 7.7 |
| Screening (n) | 3 | 72 | 43 | - | 65 | 72 | 59 | - | 144 | 58 | - | - | 120 | 636 | 636 |
| (%) | 2.4 | 9.9 | 5.8 | - | 5.8 | 7.6 | 9.6 | - | 4.0 | 4.1 | - | - | 10.5 | 4.6 | 6.1 |
| Other (n) | 5 | 5 | 7 | - | - | - | - | - | 42 | 2 | - | - | 9 | 70 | 70 |
| (%) | 3.9 | 0.7 | 0.9 | - | - | - | - | - | 1.2 | 0.1 | - | - | 0.8 | 0.5 | 0.7 |
| Unknown (n) | 52 | 184 | 27 | 210 | 324 | 75 | 29 | 720 | 2,082 | 369 | 1,814 | 533 | 62 | 6,481 | 3,204 |
| (%) | 40.9 | 25.3 | 3.6 | 100.0 | 28.7 | 7.9 | 4.7 | 100.0 | 57.9 | 26.0 | 100.0 | 100.0 | 5.4 | 47.2 | 30.6 |

(%) column percentage Pearson chi2(48) = 7.7e+03, p<0.0001 EMH chi2(48) = 7.9e+03, p<0.00001

[1] registration units with records only, i.e. units d, h, k and l excluded

Table 17: Colorectal cancer: distribution of basis of diagnosis codes by sex, age group and year of diagnosis (n=13,738)

| Basis of diagnosis | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| DCO (n) | 49 | 68 | 1 | 5 | 8 | 40 | 63 | 12 | 26 | 22 | 30 | 27 | 117 |
| (%) | 0.6 | 1.1 | 0.1 | 0.2 | 0.2 | 1.0 | 3.2 | 0.5 | 1.0 | 0.8 | 1.1 | 1.0 | 0.9 |
| Clinical (n) | 35 | 52 | 1 | 3 | 3 | 20 | 60 | 16 | 15 | 23 | 13 | 20 | 87 |
| (%) | 0.5 | 0.9 | 0.1 | 0.1 | 0.1 | 0.5 | 3.1 | 0.6 | 0.6 | 0.8 | 0.5 | 0.7 | 0.6 |
| Clinical investigation (n) | 67 | 117 | 4 | 3 | 21 | 37 | 119 | 15 | 30 | 42 | 40 | 57 | 184 |
| (%) | 0.9 | 1.9 | 0.3 | 0.1 | 0.6 | 0.9 | 6.1 | 0.6 | 1.1 | 1.5 | 1.5 | 2.0 | 1.3 |
| Tumour markers (n) | 10 | 15 | - | 1 | 3 | 8 | 13 | 11 | 2 | 3 | 7 | 2 | 25 |
| (%) | 0.1 | 0.3 | - | 0.0 | 0.1 | 0.2 | 0.7 | 0.4 | 0.1 | 0.1 | 0.3 | 0.1 | 0.2 |
| Cytology (n) | 11 | 9 | 1 | 3 | 3 | 5 | 8 | 5 | - | 5 | 2 | 8 | 20 |
| (%) | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.4 | 0.2 | - | 0.2 | 0.1 | 0.3 | 0.2 |
| Histology of metastasis (n) | 63 | 53 | 12 | 22 | 35 | 26 | 21 | 12 | 24 | 25 | 24 | 31 | 116 |
| (%) | 0.8 | 0.9 | 0.8 | 0.9 | 0.9 | 0.6 | 1.1 | 0.5 | 0.9 | 0.9 | 0.9 | 1.1 | 0.8 |
| Histology of primary tumour (n) | 7,461 | 5,719 | 1,518 | 2,408 | 3,685 | 3,898 | 1,671 | 2,617 | 2,572 | 2,708 | 2,633 | 2,650 | 13,180 |
| (%) | 96.9 | 94.7 | 98.7 | 98.5 | 98.0 | 96.6 | 85.3 | 97.3 | 96.4 | 95.7 | 95.8 | 94.6 | 95.9 |
| Unknown (n) | 5 | 4 | 1 | - | 2 | 3 | 3 | 2 | - | 1 | 1 | 5 | 9 |
| (%) | 0.1 | 0.1 | 0.1 | - | 0.1 | 0.1 | 0.2 | 0.1 | - | 0.0 | 0.0 | 0.2 | 0.1 |

(%) column percentage

Sex: Pearson chi2(7) = 51.61, p<0.0001 Age: Pearson chi2(28) = 861.28, p<0.0001 Year: Pearson chi2(28) = 73.9, p<0.0001

Table 18: Colorectal cancer: distribution of basis of diagnosis codes by registration unit (n=13,738)

| Basis of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| DCO (n) | 2 | 25 | - | 1 | 3 | 2 | 1 | - | 62 | 5 | 10 | 3 | 3 | 117 |
| (%) | 1.6 | 3.4 | - | 0.5 | 0.3 | 0.2 | 0.2 | - | 1.7 | 0.4 | 0.6 | 0.6 | 0.3 | 0.9 |
| Clinical (n) | 1 | 1 | 3 | 7 | - | 3 | 1 | - | 13 | 5 | 30 | 22 | 1 | 87 |
| (%) | 0.8 | 0.1 | 0.4 | 3.3 | - | 0.3 | 0.2 | - | 0.4 | 0.4 | 1.7 | 4.1 | 0.1 | 0.6 |
| Clinical investigation (n) | 6 | 26 | 17 | - | 25 | 19 | 1 | 1 | 33 | 23 | - | - | 33 | 184 |
| (%) | 4.7 | 3.6 | 2.3 | - | 2.2 | 2.0 | 0.2 | 0.1 | 0.9 | 1.6 | - | - | 2.9 | 1.3 |
| Tumour markers (n) | - | - | - | - | - | - | 18 | - | 2 | 2 | - | - | 3 | 25 |
| (%) | - | - | - | - | - | - | 2.9 | - | 0.1 | 0.1 | - | - | 0.3 | 0.2 |
| Cytology (n) | - | 1 | - | 2 | 3 | 2 | - | 1 | 2 | 3 | 1 | - | 5 | 20 |
| (%) | - | 0.1 | - | 1.0 | 0.3 | 0.2 | - | 0.1 | 0.1 | 0.2 | 0.1 | - | 0.4 | 0.2 |
| Histology of metastasis (n) | 1 | 10 | 14 | 3 | 4 | 13 | 7 | 3 | 20 | 12 | 20 | 9 | - | 116 |
| (%) | 0.8 | 1.4 | 1.9 | 1.4 | 0.4 | 1.4 | 1.1 | 0.4 | 0.6 | 0.8 | 1.1 | 1.7 | - | 0.8 |
| Histology of primary tumour (n) | 117 | 660 | 710 | 197 | 1,096 | 914 | 589 | 715 | 3,462 | 1,370 | 1,752 | 499 | 1,099 | 13,180 |
| (%) | 92.1 | 90.7 | 95.4 | 93.8 | 96.9 | 95.9 | 95.3 | 99.3 | 96.3 | 96.3 | 96.6 | 93.6 | 96.1 | 95.9 |
| Unknown (n) | - | 5 | - | - | - | - | 1 | - | - | 2 | 1 | - | - | 9 |
| (%) | - | 0.7 | - | - | - | - | 0.2 | - | - | 0.1 | 0.1 | - | - | 0.1 |

(%) column percentage

Pearson chi2(84) = 829.10, p<0.0001 EMH chi2 (84) = 757.23, p<0.00001

### 3.2.2 Grade and TNM staging

Histological grade and TNM staging information corresponded to level 2 data. The cancer registries were not required to provide NICER with such information. Due to missing classification information, CRC diagnoses of the **units d, k and l** fell into the category 'unknown' and were excluded from the analyses of the distribution of codes ***by registration unit.***

Table 19 presents the distribution of ***histological grading codes*** for CRC by sex, age group and year of diagnosis. The sex distribution was slightly in favour of females, except for grade 2 ($p<0.0001$). Non-specific coding of histological grade rose from 24% (age 65-74) to 35% (age 85+) and confirms an age gradient, which was already observed with outcome variables topography and morphology ($p<0.0001$). This pattern indicates that, with regards to histological grade, cancer registrations among the very elderly were not as clearly differentiated as those among patients falling under the two prior age categories. As a consequence, the coding of grade 1 (well-differentiated tumour) decreased steadily from 9% (age <55) to 2% (age 85+) and that of grade 2 (moderately differentiated tumour) from 54% (age 65-74) to 42% (age 85+). The proportions of grade 3 (poorly differentiated tumour) and grade X (undetermined grade) varied in a fairly narrow range across the age groups. All grading codes differed less than 4% by year of diagnosis. Nevertheless, the proportion of non-specific coding of histological grade decreased slightly in 2012 ($p<0.0001$). Of all codes, the most common was grade 2 (61%), with proportions ranging from 49-74% between the units (table 20). Grade 3 was the second most frequently recorded (22%), with proportions in the range 14-28%. Non-specific coding of histological grade was the third most frequently assigned code (11%) and varied from 3% in **unit j** to 25% in **unit f** ($p<0.0001$). The proportions of codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.00001$). Non-specific coding of histological grade was highest if the detection method was unknown (80%). CRC diagnoses assigned grade 1, grade 2, grade 3 or grade X were mainly symptomatically detected (38-80%), followed by unknown mode of detection (14-36%). Further, 12% of all CRC diagnoses assigned grade 1 were screen-detected ($\chi^2(16) = 2.8e+03$; $p<0.0001$).

The ***cTNM codes*** for CRC differed negligibly between the sexes (tables 21-23). Codes cTX, cNX and cMX became the most frequently recorded with increasing age and indicated that the tumour-node-metastasis information could not be assessed mainly in patients aged 85+ years, with frequencies of 25% (+12%), 26% (+13%) and 30% (+7%), respectively. In contrast, almost all remaining cTNM codes decreased with age. However, non-specific coding of the cM category increased from 25% (age 55-64) to 30% (age 85+; $p<0.0001$). Non-specific coding of tumour stage decreased during the observation period ($p<0.0001$) – however, for the categories cT and cN only until 2010 (from 64% to 49% and from 61% to 46%, respectively) and for the category cM until 2011 (from 34% to 24%). In contrast, all remaining cTNM categories were more frequently used during the years in question. These results indicate an improvement in coding of cTNM until 2010/2011. Non-specific coding of all clinical TNM categories was the highest if the detection method was unknown (65-86%) and the second highest for tumour symptoms (12-29%). Apart from code T1, T codes were primarily consistent with symptomatic detection (33-74%). Of the cT1 assignments (invasive tumour infiltrating submucosa), 35% fell under method of detection 'unknown', 30% under tumour symptoms, and 20% under screening methods. CRC diagnoses assigned code cT0 (no indication of primary tumour) had an even higher screening proportion (22%; $\chi^2(24) = 3.0e+03$; $p<0.0001$). All clinical N codes were highest if the CRC was detected following symptoms by the patient (48%-78%) and the second highest for unknown mode of detection (10-41%). CRC diagnoses

assigned code cN0 (no regional lymph node metastases) had the highest screening proportion (11%) and those assigned cN1 (metastases in 1-3 regional lymph nodes) the second highest (5%; $\chi^2(20) = 2.8e+03$; $p<0.0001$). All clinical M codes showed a similar pattern to that of the other two categories. Their proportions were highest for tumour symptoms (44-67%) and the second highest for unknown mode of detection (25-38%). CRC diagnoses assigned cM0 (absence of distant metastases) had the highest screening proportion (7%) and those assigned cMX (distant metastases cannot be assessed) the second highest (6%; $\chi^2(12) = 3.3e+03$; $p<0.0001$).

The ***pTNM codes*** hardly differed by sex (tables 24-26). The coding pattern of the pathological categories was similar to the observed pattern of the clinical categories across the age groups. Non-specific coding of code pT increased from 26% (age 65-74) to 40% (age 85+) and that of code pN from 31% (age 65-74) to 43% (age 85+). Non-specific coding of code pM differed only slightly across all age groups ($p<0.0001$). The proportions of the codes pTX, pNX and pMX also increased with age, and therefore the primary tumour could not be assessed especially in patients aged 85+ years. In contrast, the coding of all remaining pTNM categories decreased with age, but not steadily, since some categories were rather coded in the three middle age groups ($p<0.0001$). Non-specific coding of the entire pTNM classification decreased until 2010 (-10% overall) and rose slightly in 2011, before declining slightly in 2012 ($p<0.0001$). These results suggest a better coding of TNM information in 2010 for both clinical and pathological codes and are supported by the frequent recording of the other TNM categories in 2010. Non-specific coding of all pathological TNM categories was the highest if the method of detection was unknown (56-82%) and the second highest for tumour symptoms (15-36%). The other pathological TNM codes showed the same pattern. The codes, which indicate an early stage within the T category, had the highest proportion of screening methods (pT1=16%, pTis=14%), pT0=6% and pT2=8%; $\chi^2(28) = 3.7e+03$; $p<0.0001$). This pattern was repeated in the N category (pN0=7% and pN1=5%), but also if the regional lymph nodes could not be assessed (pNX=6%; $\chi^2(20) = 2.7e+03$; $p<0.0001$), and for the M category if distant metastases could not be assessed (pMX=7%; $\chi^2(12) = 1.1e+03$; $p<0.0001$).

Tables 27-29 present the distribution of ***the cTNM codes by registration unit***. Less than 1% of all CRC diagnoses were not coded according to the clinical T classification, as some registries also assigned the codes 'T1a-c', 'T2b-c', 'T3a-c', 'T4c' and 'Ta'. Only **units a, c, f and i** listed correct codes. **Unit e** used incorrect T codes the most. Throughout the entire cTNM classification, the proportions of non-specific assignments were extremely low in **units h and m** (≤1%), and **units e and g** had even no such assignments. Registries providing information on the clinical T category (tumour description) mainly coded non-specifically (43%). The proportions varied widely from <1% in **unit h** to 86% in **unit c**. Codes cTX and cT3 (invasive tumour grown into subserosa) were second most frequently recorded (20% both) and also ranged widely between the units. The large variation of code cTX was due to its very high proportion in **unit e** (80%), which partly explains why this registry had no unspecific records ($p<0.0001$). The proportion of code cTX was also high in **unit b and unit h** (54% both) and that of code cT3 in **units g and m** (43% and 44%). The proportions of codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.0001$). Five registries failed to code according to the clinical N classification, as they included cN3 (<1% overall). Only **units a, c and f** listed correct cN and cT codes. Registries which provided information on the clinical N category (regional lymph node involvement) coded mainly non-specifically (39%). The relevant proportions varied widely from <1% in **unit h** to 84% in **unit c**. Codes cNX and cN0 were the second most recorded (21% both)

and also varied widely across the units. As with cT, the large variation of code cNX was due to its high proportion in **unit e** (80%), which partly explains why this registry did not code non-specifically at all (p<0.0001). Code cNX was also frequently recorded in **unit b and unit h** (47% and 54%). **Unit g and unit m** mainly recorded code cN0 (48% and 46%). The described coding pattern remained statistically significant when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.0001). All registries coded according to the 6th edition of the UICC TNM classification of malignant tumours, as they assigned code cMX in 7% of all cases. Registries providing information on the clinical M category (absence or presence of distant metastases) mainly coded cM0 (66%), which states that there was no indication of a primary tumour. They recorded second most frequently that the tumour spread to distant organs by using cM1 (18%) and only a small proportion of their cases as non-specifically (9%). **Unit a** had the highest proportion of non-specific coding (45%) and **unit b** the lowest (6.5%). **Units e, g h and m** had no non-specific records and their highest proportions in category cM0 (p<0.0001). The proportions of codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.0001).

Tables 30-32 present the distribution of the ***p*TNM *codes by registration unit***. Less than 1% of the CRC diagnoses were not coded according to the clinical T classification, as some registries also assigned codes 'T1a-b', 'T1mic', 'T2a-c'and 'T3a-c'. None of the registries used correct pT codes throughout. **Unit e** used incorrect pathological T codes the most and did not code non-specific throughout the entire pTNM classification. The proportions of non-specific coding of pTNM were extremely low in **units h and m** (<1%). All registries mainly assigned code pT3 (39%), in a rather narrow range (35-43%). The second most common were the codes pT4 (16%) and pT1 (13%), both also in a rather narrow range (11-20% and 9-16%, respectively). All registries coded third most frequently non-specifically (12%). The proportions widely differed from <1 in **units h and m** to 29% in **unit j** (p<0.0001). Only a few of the CRC diagnoses were assigned code pTX (5%) and code pTis (3%), however, these codes varied widely between the registries. The large variation of code pTis was due to its very high proportion in **unit f** (17%) and that of code pTX in **units b, e and m** (15%, 16% and 20%, respectively). The proportions of codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.0001). Only **unit i** did not code according to the pathological N classification by using code 'pN3' (<0.1% overall). All registries most frequently assigned coded pN0 (42%) and second most frequently indicated that the value of the pN category was unknown (18%). Non-specific coding of pN ranged from <1% in **units h and m** to 34% in **unit j** (p<0.0001)**.** The registries also assigned code pN1 in 18% of all cases and third frequently code N2 (14%). Again, the proportions of code pNX were the highest in **units b, e and m** (22%, 19% and 29%). The coding pattern remained statistically significant when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.0001). Registration **units a, f, g and j** coded according to the 7th edition of the UICC TNM classification of malignant tumours and therefore avoided code pMX. All other registries coded according to the 6th edition by using code pMX. Registries providing information on the clinical M category most frequently coded non-specifically (59%). The proportions of non-specific coding of pM ranged from 6.5% in **unit b** to 95% in **unit i** (p<0.0001). **Unit f and unit j** also coded more than 90% of their CRC diagnoses non-specifically. **Units e, h and m** did not code non-specifically and therefore had the highest proportion of code pMX, which was the second most frequently used code of all (32%). The third common code was pM1 (8%). The proportion of pM0 was the smallest of all codes (1%), however, **unit a** coded 65% of its CRC diagnoses using pM0. The proportions

of codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.0001$).

Table 19: Colorectal cancer: distribution of histological grading codes by sex, age group and year of diagnosis (n=13,738)

| Grade | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| Grade 1 (n) | 355 | 296 | 138 | 140 | 166 | 164 | 43 | 110 | 109 | 129 | 137 | 166 | 651 |
| (%) | 4.6 | 4.9 | 9.0 | 5.7 | 4.4 | 4.1 | 2.2 | 4.1 | 4.1 | 4.6 | 5.0 | 5.9 | 4.7 |
| Grade 2 (n) | 3,953 | 2,817 | 660 | 1,242 | 2,010 | 2,033 | 825 | 1,367 | 1,362 | 1,333 | 1,332 | 1,376 | 6,770 |
| (%) | 51.3 | 46.7 | 42.9 | 50.8 | 53.5 | 50.4 | 42.1 | 50.8 | 51.0 | 47.1 | 48.4 | 49.1 | 49.3 |
| Grade 3 (n) | 1,243 | 1,197 | 262 | 419 | 635 | 761 | 363 | 460 | 441 | 561 | 500 | 478 | 2,440 |
| (%) | 16.1 | 19.8 | 17.0 | 17.1 | 16.9 | 18.9 | 18.5 | 17.1 | 16.5 | 19.8 | 18.2 | 17.1 | 17.8 |
| Grade X (n) | 70 | 68 | 12 | 24 | 34 | 32 | 36 | 20 | 19 | 22 | 31 | 46 | 138 |
| (%) | 0.9 | 1.1 | 0.8 | 1.0 | 0.9 | 0.8 | 1.8 | 0.7 | 0.7 | 0.8 | 1.1 | 1.6 | 1.0 |
| Unknown (n) | 2,080 | 1,659 | 466 | 620 | 915 | 1,047 | 691 | 733 | 738 | 784 | 750 | 734 | 3,739 |
| (%) | 27.0 | 27.5 | 30.3 | 25.4 | 24.3 | 25.9 | 35.3 | 27.3 | 27.7 | 27.7 | 27.3 | 26.2 | 27.2 |

(%) column percentage

Sex: Pearson chi2(4) = 43.35, p<0.0001 Age: Pearson chi2(16) = 234.78, p<0.0001 Year: Pearson chi2(16) = 49.35, p<0.0001

Table 20: Colorectal cancer: distribution of histological grading codes by registration unit (n=13,738)

| Grade | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| Grade 1 (n) | 8 | 33 | 53 | - | 67 | 80 | 25 | 25 | 152 | 53 | - | - | 155 | 651 | 651 |
| (%) | 6.3 | 4.5 | 7.1 | - | 5.9 | 8.4 | 4.1 | 3.5 | 4.2 | 3.7 | - | - | 13.6 | 4.7 | 5.8 |
| Grade 2 (n) | 74 | 400 | 448 | - | 731 | 467 | 422 | 529 | 2,148 | 877 | - | - | 674 | 6,770 | 6,770 |
| (%) | 58.3 | 55.0 | 60.2 | - | 64.6 | 49.0 | 68.3 | 73.5 | 59.8 | 61.7 | - | - | 58.9 | 49.3 | 60.5 |
| Grade 3 (n) | 24 | 200 | 136 | - | 260 | 132 | 112 | 141 | 875 | 399 | - | - | 161 | 2,440 | 2,440 |
| (%) | 18.9 | 27.5 | 18.3 | - | 23.0 | 13.9 | 18.1 | 19.6 | 24.4 | 28.1 | - | - | 14.1 | 17.8 | 21.8 |
| Grade X (n) | 7 | 3 | - | - | - | 40 | 30 | - | - | 58 | - | - | - | 138 | 138 |
| (%) | 5.5 | 0.4 | - | - | - | 4.2 | 4.9 | - | - | 4.1 | - | - | - | 1.0 | 1.2 |
| Unknown (n) | 14 | 92 | 107 | 210 | 73 | 234 | 29 | 25 | 419 | 35 | 1,814 | 533 | 154 | 3,739 | 1,182 |
| (%) | 11.0 | 12.6 | 14.4 | 100.0 | 6.5 | 24.6 | 4.7 | 3.5 | 11.7 | 2.5 | 100.0 | 100.0 | 13.5 | 27.2 | 10.6 |

(%) column percentage Pearson chi2(48) = 9.4e+03, p<0.0001 EMH chi2(48) = 5.6e+03, p<0.00001

[1] registration units with records only, i.e. units d, k and l excluded

Table 21: Colorectal cancer: distribution of cT-codes (TNM) by sex, age group and year of diagnosis (n= 3,738)

| cT-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| T0 (n) | 4 | 5 | 2 | 3 | - | 4 | - | 1 | - | 2 | 3 | 3 | 9 |
| (%) | 0.1 | 0.1 | 0.1 | 0.1 | - | 0.1 | - | 0.0 | - | 0.1 | 0.1 | 0.1 | 0.1 |
| T1 (n) | 320 | 237 | 71 | 131 | 171 | 146 | 38 | 96 | 140 | 118 | 97 | 106 | 557 |
| (%) | 4.2 | 3.9 | 4.6 | 5.4 | 4.6 | 3.6 | 1.9 | 3.6 | 5.3 | 4.2 | 3.5 | 3.8 | 4.1 |
| T2 (n) | 268 | 221 | 55 | 92 | 132 | 160 | 50 | 67 | 103 | 119 | 101 | 99 | 489 |
| (%) | 3.5 | 3.7 | 3.6 | 3.8 | 3.5 | 4.0 | 2.6 | 2.5 | 3.9 | 4.2 | 3.7 | 3.5 | 3.6 |
| T3 (n) | 1,353 | 919 | 254 | 478 | 676 | 629 | 235 | 277 | 482 | 524 | 479 | 510 | 2,272 |
| (%) | 17.6 | 15.2 | 16.5 | 19.6 | 18.0 | 15.6 | 12.0 | 10.3 | 18.1 | 18.5 | 17.4 | 18.2 | 16.5 |
| T4 (n) | 375 | 406 | 89 | 123 | 189 | 245 | 135 | 96 | 155 | 174 | 174 | 182 | 781 |
| (%) | 4.9 | 6.7 | 5.8 | 5.0 | 5.0 | 6.1 | 6.9 | 3.6 | 5.8 | 6.2 | 6.3 | 6.5 | 5.7 |
| TX (n) | 1,247 | 1,042 | 204 | 330 | 576 | 687 | 492 | 438 | 372 | 506 | 515 | 458 | 2,289 |
| (%) | 16.2 | 17.3 | 13.3 | 13.5 | 15.3 | 17.0 | 25.1 | 16.3 | 13.9 | 17.9 | 18.7 | 16.4 | 16.7 |
| Unknown (n) | 4,134 | 3,207 | 863 | 1,288 | 2,016 | 2,166 | 1,008 | 1,715 | 1,417 | 1,386 | 1,381 | 1,442 | 7,341 |
| (%) | 53.7 | 53.1 | 56.1 | 52.7 | 53.6 | 53.7 | 51.5 | 63.8 | 53.1 | 49.0 | 50.2 | 51.5 | 53.4 |

(%) column percentage

Sex: Pearson chi2(6) = 35.52, p<0.0001 Age: Pearson chi2(24) = 224.84, p<0.0001 Year: Pearson chi2(24) = 230.48, p<0.0001

Table 22: Colorectal cancer: distribution of cN-codes (TNM) by sex, age group and year of diagnosis (n=13,738)

| cN-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| N0 (n) | 1,368 | 1,007 | 256 | 455 | 666 | 733 | 265 | 360 | 498 | 493 | 524 | 500 | 2,375 |
| (%) | 17.8 | 16.7 | 16.6 | 18.6 | 17.7 | 18.2 | 13.5 | 13.4 | 18.7 | 17.4 | 19.1 | 17.9 | 17.3 |
| N1 (n) | 850 | 578 | 183 | 300 | 407 | 395 | 143 | 219 | 261 | 316 | 304 | 328 | 1,428 |
| (%) | 11.0 | 9.6 | 11.9 | 12.3 | 10.8 | 9.8 | 7.3 | 8.1 | 9.8 | 11.2 | 11.1 | 11.7 | 10.4 |
| N2 (n) | 381 | 297 | 102 | 136 | 198 | 174 | 68 | 61 | 141 | 183 | 137 | 156 | 678 |
| (%) | 5.0 | 4.9 | 6.6 | 5.6 | 5.3 | 4.3 | 3.5 | 2.3 | 5.3 | 6.5 | 5.0 | 5.6 | 4.9 |
| N3 (n) | 6 | 7 | 2 | - | 5 | 5 | 1 | - | 2 | 2 | 3 | 6 | 13 |
| (%) | 0.1 | 0.1 | 0.1 | - | 0.1 | 0.1 | 0.1 | - | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 |
| NX (n) | 1,244 | 1,102 | 201 | 356 | 601 | 681 | 507 | 422 | 427 | 529 | 489 | 479 | 2,346 |
| (%) | 16.2 | 18.3 | 13.1 | 14.6 | 16.0 | 16.9 | 25.9 | 15.7 | 16.0 | 18.7 | 17.8 | 17.1 | 17.1 |
| Unknown (n) | 3,852 | 3,046 | 794 | 1,198 | 1,883 | 2,049 | 974 | 1,628 | 1,340 | 1,306 | 1,293 | 1,331 | 6,898 |
| (%) | 50.0 | 50.5 | 51.6 | 49.0 | 50.1 | 50.8 | 49.7 | 60.5 | 50.2 | 46.2 | 47.0 | 47.5 | 50.2 |

(%) column percentage

Sex: Pearson chi2(5) = 18.66, p=0.002 Age: Pearson chi2(20) = 197.04, p<0.0001 Year: Pearson chi2(20) = 201.85, p<0.0001

Table 23: Colorectal cancer: distribution of cM-codes (TNM) by sex, age group and year of diagnosis (n=13,738)

| cM-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| M0 (n) | 4,130 | 3,250 | 826 | 1,367 | 2,096 | 2,234 | 857 | 1,310 | 1,491 | 1,583 | 1,488 | 1,508 | 7,380 |
| (%) | 53.6 | 53.8 | 53.7 | 55.9 | 55.7 | 55.3 | 43.8 | 48.7 | 55.9 | 56.0 | 54.1 | 53.9 | 53.7 |
| M1 (n) | 1,132 | 860 | 201 | 368 | 571 | 548 | 304 | 363 | 399 | 406 | 425 | 399 | 1,992 |
| (%) | 14.7 | 14.3 | 13.1 | 15.1 | 15.2 | 13.6 | 15.5 | 13.5 | 15.0 | 14.4 | 15.5 | 14.3 | 14.5 |
| MX (n) | 417 | 347 | 64 | 97 | 168 | 218 | 217 | 114 | 126 | 155 | 185 | 184 | 764 |
| (%) | 5.4 | 5.8 | 4.2 | 4.0 | 4.5 | 5.4 | 11.1 | 4.2 | 4.7 | 5.5 | 6.7 | 6.6 | 5.6 |
| Unknown (n) | 2,022 | 1,580 | 447 | 613 | 925 | 1,037 | 580 | 903 | 653 | 685 | 652 | 709 | 3,602 |
| (%) | 26.3 | 26.2 | 29.1 | 25.1 | 24.6 | 25.7 | 29.6 | 33.6 | 24.5 | 24.2 | 23.7 | 25.3 | 26.2 |

(%) column percentage

Sex: Pearson chi2(3) = 1.19, p=0.755 Age: Pearson chi2(12) = 201.83, p<0.0001 Year: Pearson chi2(12) = 115.88, p<0.0001

Table 24: Colorectal cancer: distribution of pT-codes (TNM) by sex, age group and year of diagnosis (n=13,738)

| pT-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| T0 (n) | 58 | 38 | 24 | 24 | 33 | 15 | - | 7 | 17 | 24 | 22 | 26 | 96 |
| (%) | 0.8 | 0.6 | 1.6 | 1.0 | 0.9 | 0.4 | - | 0.3 | 0.6 | 0.9 | 0.8 | 0.9 | 0.7 |
| T1 (n) | 823 | 574 | 219 | 304 | 431 | 351 | 92 | 225 | 251 | 289 | 299 | 333 | 1,397 |
| (%) | 10.7 | 9.5 | 14.2 | 12.4 | 11.5 | 8.7 | 4.7 | 8.4 | 9.4 | 10.2 | 10.9 | 11.9 | 10.2 |
| T2 (n) | 735 | 531 | 133 | 262 | 359 | 391 | 121 | 208 | 262 | 258 | 261 | 277 | 1,266 |
| (%) | 9.5 | 8.8 | 8.7 | 10.7 | 9.6 | 9.7 | 6.2 | 7.7 | 9.8 | 9.1 | 9.5 | 9.9 | 9.2 |
| T3 (n) | 2,467 | 1,869 | 441 | 765 | 1,243 | 1,354 | 533 | 773 | 891 | 897 | 882 | 893 | 4,336 |
| (%) | 32.0 | 31.0 | 28.7 | 31.3 | 33.1 | 33.5 | 27.2 | 28.7 | 33.4 | 31.7 | 32.1 | 31.9 | 31.6 |
| T4 (n) | 891 | 893 | 186 | 303 | 473 | 570 | 252 | 299 | 333 | 411 | 380 | 361 | 1,784 |
| (%) | 11.6 | 14.8 | 12.1 | 12.4 | 12.6 | 14.1 | 12.9 | 11.1 | 12.5 | 14.5 | 13.8 | 12.9 | 13.0 |
| TX (n) | 303 | 290 | 43 | 86 | 138 | 159 | 167 | 114 | 127 | 126 | 111 | 115 | 593 |
| (%) | 3.9 | 4.8 | 2.8 | 3.5 | 3.7 | 3.9 | 8.5 | 4.2 | 4.8 | 4.5 | 4.0 | 4.1 | 4.3 |
| Tis (n) | 210 | 134 | 51 | 71 | 122 | 85 | 15 | 74 | 85 | 78 | 52 | 55 | 344 |
| (%) | 2.7 | 2.2 | 3.3 | 2.9 | 3.2 | 2.1 | 0.8 | 2.8 | 3.2 | 2.8 | 1.9 | 2.0 | 2.5 |
| Unknown (n) | 2,214 | 1,708 | 441 | 630 | 961 | 1,112 | 778 | 990 | 703 | 746 | 743 | 740 | 3,922 |
| (%) | 28.8 | 28.3 | 28.7 | 25.8 | 25.6 | 27.6 | 39.7 | 36.8 | 26.3 | 26.4 | 27.0 | 26.4 | 28.6 |

(%) column percentage

Sex: Pearson chi2(7) = 45.3, p<0.0001 Age: Pearson chi2(28) = 450.65, p<0.0001 Year: Pearson chi2(28) = 160.16, p<0.0001

Table 25: Colorectal cancer: distribution of pN-codes (TNM) by sex, age group and year of diagnosis (n=13,738)

| pN-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| N0 (n) | 2,646 | 2,068 | 476 | 858 | 1,353 | 1,485 | 542 | 796 | 928 | 973 | 994 | 1,023 | 4,714 |
| (%) | 34.4 | 34.3 | 31.0 | 35.1 | 36.0 | 36.8 | 27.7 | 29.6 | 34.8 | 34.4 | 36.2 | 36.5 | 34.3 |
| N1 (n) | 1,128 | 865 | 217 | 385 | 588 | 587 | 216 | 322 | 397 | 409 | 422 | 443 | 1,993 |
| (%) | 14.7 | 14.3 | 14.1 | 15.8 | 15.6 | 14.5 | 11.0 | 12.0 | 14.9 | 14.5 | 15.4 | 15.8 | 14.5 |
| N2 (n) | 843 | 738 | 202 | 294 | 451 | 457 | 177 | 309 | 340 | 377 | 281 | 274 | 1,581 |
| (%) | 11.0 | 12.2 | 13.1 | 12.0 | 12.0 | 11.3 | 9.0 | 11.5 | 12.7 | 13.3 | 10.2 | 9.8 | 11.5 |
| N3 (n) | 2 | - | - | - | - | 2 | - | 1 | - | - | - | 1 | 2 |
| (%) | 0.0 | - | - | - | - | 0.1 | - | 0.0 | - | - | - | 0.0 | 0.0 |
| NX (n) | 467 | 405 | 102 | 139 | 207 | 233 | 191 | 149 | 163 | 197 | 180 | 183 | 872 |
| (%) | 6.1 | 6.7 | 6.6 | 5.7 | 5.5 | 5.8 | 9.8 | 5.5 | 6.1 | 7.0 | 6.6 | 6.5 | 6.4 |
| Unknown (n) | 2,615 | 1,961 | 541 | 769 | 1,161 | 1,273 | 832 | 1,113 | 841 | 873 | 873 | 876 | 4,576 |
| (%) | 34.0 | 32.5 | 35.2 | 31.5 | 30.9 | 31.5 | 42.5 | 41.4 | 31.5 | 30.9 | 31.8 | 31.3 | 33.3 |

(%) column percentage

Sex: Pearson chi2(5) = 11.04, p=0.051 Age: Pearson chi2(20) = 191.61, p<0.0001 Year: Pearson chi2(20) = 137.80, p<0.0001

Table 26: Colorectal cancer: distribution of pM-codes (TNM) by sex, age group and year of diagnosis (n=13,738)

| pM-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 7,701 | 6,037 | 1,538 | 2,445 | 3,760 | 4,037 | 1,958 | 2,690 | 2,669 | 2,829 | 2,750 | 2,800 | 13,738 |
| M0 (n) | 84 | 63 | 15 | 19 | 46 | 52 | 15 | 14 | 21 | 14 | 8 | 90 | 147 |
| (%) | 1.1 | 1.0 | 1.0 | 0.8 | 1.2 | 1.3 | 0.8 | 0.5 | 0.8 | 0.5 | 0.3 | 3.2 | 1.1 |
| M1 (n) | 501 | 378 | 120 | 196 | 254 | 227 | 82 | 108 | 193 | 200 | 168 | 210 | 879 |
| (%) | 6.5 | 6.3 | 7.8 | 8.0 | 6.8 | 5.6 | 4.2 | 4.0 | 7.2 | 7.1 | 6.1 | 7.5 | 6.4 |
| MX (n) | 1,902 | 1,621 | 363 | 606 | 940 | 1,073 | 541 | 624 | 629 | 848 | 749 | 673 | 3,523 |
| (%) | 24.7 | 26.9 | 23.6 | 24.8 | 25.0 | 26.6 | 27.6 | 23.2 | 23.6 | 30.0 | 27.2 | 24.0 | 25.6 |
| Unknown (n) | 5,214 | 3,975 | 1,040 | 1,624 | 2,520 | 2,685 | 1,320 | 1,944 | 1,826 | 1,767 | 1,825 | 1,827 | 9,189 |
| (%) | 67.7 | 65.8 | 67.6 | 66.4 | 67.0 | 66.5 | 67.4 | 72.3 | 68.4 | 62.5 | 66.4 | 65.3 | 66.9 |

(%) column percentage

Sex: Pearson chi2(3) = 8.2, p=0.041 Age: Pearson chi2(12) = 49.21, p<0.0001 Year: Pearson chi2(12) = 247.80, p<0.0001

Table 27: Colorectal cancer: distribution of cT-codes (TNM) by registration unit (n=13,738)

| cT-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| T0 (n) | 1 | 2 | 1 | - | - | - | - | 1 | - | 4 | - | - | - | 9 | 9 |
| (%) | 0.8 | 0.3 | 0.1 | - | - | - | - | 0.1 | - | 0.3 | - | - | - | 0.1 | 0.1 |
| **T1- (n)** | **-** | **27** | **3** | **-** | **12** | **1** | **96** | **121** | **8** | **136** | **-** | **-** | **153** | **557** | **557** |
| **(%)** | **-** | **3.7** | **0.4** | **-** | **1.1** | **0.1** | **15.5** | **16.8** | **0.2** | **9.6** | **-** | **-** | **13.4** | **4.1** | **5.0** |
| T1 (%)[1] | - | 100.0 | 100.0 | - | 100.0 | 100.0 | 96.9 | 99.2 | 100.0 | 94.9 | - | - | 100.0 | 98.0 | |
| T1a (%)[1] | - | - | - | - | - | - | 3.1 | - | - | 4.4 | - | - | - | 1.6 | |
| T1b (%)[1] | - | - | - | - | - | - | - | - | - | 0.7 | - | - | - | 0.2 | |
| T1c (%)[1] | - | - | - | - | - | - | - | 0.8 | - | - | - | - | - | 0.2 | |
| **T2- (n)** | **5** | **54** | **14** | - | **21** | **12** | **78** | **27** | **43** | **117** | - | - | **118** | **489** | **489** |
| **(%)** | **3.9** | **7.4** | **1.9** | **-** | **1.9** | **1.3** | **12.6** | **3.8** | **1.2** | **8.2** | **-** | **-** | **10.3** | **3.6** | **4.4** |
| T2 (%)[1] | 100.0 | 100.0 | 100.0 | - | 95.2 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | - | - | 99.2 | 99.6 | |
| T2b (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 0.8 | 0.2 | |
| T2c (%)[1] | - | - | - | - | 4.8 | - | - | - | - | - | - | - | - | 0.2 | |
| **T3- (n)** | **13** | **144** | **67** | - | **144** | **91** | **268** | **143** | **262** | **633** | - | - | **506** | **2,271** | **2,271** |
| **(%)** | **10.2** | **19.8** | **9.0** | - | **12.7** | **9.5** | **43.4** | **19.9** | **7.3** | **44.5** | - | - | **44.2** | **16.5** | **20.3** |
| T3 (%)[1] | 100.0 | 100.0 | 100.0 | - | 97.9 | 100.0 | 100.0 | 100.0 | 100.0 | 99.7 | - | - | 100.0 | 99.8 | |
| T3a (%)[1] | - | - | - | - | 0.7 | - | - | - | - | - | - | - | - | 0.04 | |
| T3b (%)[1] | - | - | - | - | 1.4 | - | - | - | - | 0.3 | - | - | - | 0.2 | |
| T3c (%)[1] | - | - | - | - | 6.6 | - | - | - | - | - | - | - | - | 0.04 | |
| **T4- (n)** | **8** | **56** | **16** | **-** | **46** | **11** | **105** | **34** | **77** | **213** | - | - | **215** | **781** | **781** |
| **(%)** | **6.3** | **7.7** | **2.2** | **-** | **4.1** | **1.2** | **17.0** | **4.7** | **2.1** | **15.0** | **-** | **-** | **18.8** | **5.7** | **7.0** |
| T4 (%)[1] | 75.0 | 91.1 | 93.8 | - | 91.3 | 81.8 | 52.4 | 100.0 | 93.5 | 62.4 | - | - | 100.0 | 80.9 | |
| T4a (%)[1] | 12.5 | 1.8 | - | - | 4.3 | - | 36.2 | - | 3.9 | 24.4 | - | - | - | 12.4 | |
| T4b (%)[1] | 12.5 | 5.4 | 6.3 | - | 2.2 | 18.2 | 11.4 | 0.0 | 2.6 | 13.1 | - | - | - | 6.4 | |
| T4c (%)[1] | - | 1.8 | - | - | 2.2 | - | - | - | - | - | - | - | - | 0.3 | |
| TX (n) | 6 | 392 | 6 | - | 907 | 74 | 71 | 392 | 259 | 41 | - | - | 141 | 2,289 | 2,289 |
| (%) | 4.7 | 53.9 | 0.8 | - | 80.2 | 7.8 | 11.5 | 54.4 | 7.2 | 2.9 | - | - | 12.3 | 16.7 | **20.5** |
| Ta (n) | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| (%) | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 |
| Unknown (n) | 94 | 51 | 637 | 210 | - | 764 | - | 2 | 2,945 | 278 | 1,814 | 533 | 11 | 7,339 | 4,782 |
| (%) | 74.0 | 7.0 | 85.6 | 100.0 | - | 80.2 | - | 0.3 | 81.9 | 19.6 | 100.0 | 100.0 | 1.0 | 53.4 | 42.8 |

(%) column percentage of total n

(%)[1] column percentage per n of cT-code (T1-T4)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(216) = 1.5e+04, p<0.0001

EMH chi2(72) = 1.2e+04, p<0.00001 (collapsed to main categories)

Table 28: Colorectal cancer: distribution of cN-codes (TNM) by registration unit (n=13,738)

| cN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| N0 (n) | 13 | 154 | 37 | - | 119 | 176 | 296 | 197 | 307 | 549 | - | - | 527 | 2,375 | 2,375 |
| (%) | 10.2 | 21.2 | 5.0 | - | 10.5 | 18.5 | 47.9 | 27.4 | 8.5 | 38.6 | - | - | 46.1 | 17.3 | 21.2 |
| **N1- (n)** | **16** | **143** | **39** | **-** | **91** | **64** | **131** | **123** | **212** | **312** | **-** | **-** | **297** | **1,428** | **1,428** |
| **(%)** | **12.6** | **19.6** | **5.2** | **-** | **8.0** | **6.7** | **21.2** | **17.1** | **5.9** | **21.9** | **-** | **-** | **26.0** | **10.4** | **12.8** |
| N1 (%)[1] | 81.3 | 95.1 | 97.4 | - | 97.8 | 96.9 | 71.0 | 99.2 | 96.2 | 74.7 | - | - | 99.7 | 90.1 | |
| N1a (%)[1] | 6.3 | 1.4 | 2.6 | - | - | - | 13.0 | - | 1.4 | 11.5 | - | - | - | 4.2 | |
| N1b (%)[1] | 12.5 | 3.5 | 0.0 | - | 2.2 | 3.1 | 16.0 | 0.8 | 2.4 | 13.1 | - | - | 0.3 | 5.6 | |
| N1c (%)[1] | - | - | - | - | - | - | - | - | - | 0.6 | - | - | - | 0.1 | |
| **N2- (n)** | **4** | **43** | **7** | **-** | **16** | **20** | **116** | **13** | **73** | **238** | **-** | **-** | **148** | **678** | **678** |
| **(%)** | **3.1** | **5.9** | **0.9** | **-** | **1.4** | **2.1** | **18.8** | **1.8** | **2.0** | **16.7** | **-** | **-** | **12.9** | **4.9** | **6.1** |
| N2 (%)[1] | 75.0 | 88.4 | 100.0 | - | 100.0 | 100.0 | 53.4 | 84.6 | 90.4 | 61.8 | - | - | 100.0 | 76.4 | |
| N2a (%)[1] | - | 9.3 | - | - | - | - | 16.4 | - | 4.1 | 16.0 | - | - | - | 9.4 | |
| N2b (%)[1] | 25.0 | 2.3 | - | - | - | - | 30.2 | 15.4 | 5.5 | 22.3 | - | - | - | 14.2 | |
| N3 (n) | - | 4 | - | - | 3 | - | - | - | 3 | 2 | - | - | 1 | 13 | 13 |
| (%) | - | 0.6 | - | - | 0.3 | - | - | - | 0.1 | 0.1 | - | - | 0.1 | 0.1 | 0.1 |
| NX (n) | 3 | 332 | 32 | - | 902 | 102 | 75 | 385 | 311 | 44 | - | - | 160 | 2,346 | 2,346 |
| (%) | 2.4 | 45.6 | 4.3 | - | 79.8 | 10.7 | 12.1 | 53.5 | 8.7 | 3.1 | - | - | 14.0 | 17.1 | 21.0 |
| Unknown (n) | 91 | 52 | 629 | 210 | - | 591 | - | 2 | 2,688 | 277 | 1,814 | 533 | 11 | 6,898 | 4,341 |
| (%) | 71.7 | 7.1 | 84.5 | 100.0 | - | 62.0 | - | 0.3 | 74.8 | 19.5 | 100.0 | 100.0 | 1.0 | 50.2 | 38.8 |

(%) column percentage of total n

(%)[1] column percentage per n of cN-code (N1-N2)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(120) = 1.3e+04, p<0.0001

EMH chi2(60) = 1.1e+04, p<0.00001 (collapsed to main categories)

Table 29: Colorectal cancer: distribution of cM-codes (TNM) by registration unit (n=13,738)

| cM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| M0 (n) | 48 | 405 | 324 | - | 870 | 642 | 441 | 581 | 2,561 | 827 | - | - | 681 | 7,380 | 7,380 |
| (%) | 37.8 | 55.6 | 43.6 | - | 76.9 | 67.4 | 71.4 | 80.7 | 71.3 | 58.2 | - | - | 59.5 | 53.7 | 66.0 |
| **M1- (n)** | **19** | **139** | **93** | **-** | **256** | **146** | **161** | **115** | **508** | **301** | **-** | **-** | **254** | **1,992** | **1,992** |
| **(%)** | **15.0** | **19.1** | **12.5** | **-** | **22.6** | **15.3** | **26.1** | **16.0** | **14.1** | **21.2** | **-** | **-** | **22.2** | **14.5** | **17.8** |
| M1 (%)[1] | 21.1 | 56.8 | 97.8 | - | 94.9 | 62.3 | 48.4 | 100.0 | 76.4 | 47.5 | - | - | 99.6 | 74.5 | |
| M1a (%)[1] | 63.2 | 19.4 | 1.1 | - | 1.6 | 20.5 | 27.3 | 0.0 | 13.8 | 25.6 | - | - | - | 13.3 | |
| M1b (%)[1] | 15.8 | 23.7 | 1.1 | - | 3.5 | 17.1 | 24.2 | 0.0 | 9.8 | 26.9 | - | - | 0.4 | 12.1 | |
| MX (n) | 3 | 137 | 62 | - | 5 | 102 | 16 | 24 | 189 | 17 | - | - | 209 | 764 | 764 |
| (%) | 2.4 | 18.8 | 8.3 | - | 0.4 | 10.7 | 2.6 | 3.3 | 5.3 | 1.2 | - | - | 18.3 | 5.6 | 6.8 |
| Unknown (n) | 57 | 47 | 265 | 210 | - | 63 | - | - | 336 | 277 | 1,814 | 533 | - | 3,602 | 1,045 |
| (%) | 44.9 | 6.5 | 35.6 | 100.0 | - | 6.6 | - | - | 9.4 | 19.5 | 100.0 | 100.0 | - | 26.2 | 9.3 |

(%) column percentage of total n

(%)[1] column percentage per n of cM-code (M1)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(60) = 1.1e+04, p<0.0001

EMH chi2(60) = 7.0e+03, p<0.00001

Table 30: Colorectal cancer: distribution of pT-codes (TNM) by registration unit (n=13,738)

| pT-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| T0 (n) | 1 | 14 | 5 | - | 8 | 6 | 4 | 8 | 32 | 8 | - | - | 10 | 96 | 96 |
| (%) | 0.79 | 1.92 | 0.67 | - | 0.71 | 0.63 | 0.65 | 1.11 | 0.89 | 0.56 | - | - | 0.87 | 0.7 | 0.9 |
| **T1- (n)** | **15** | **105** | **70** | **-** | **132** | **95** | **98** | **104** | **468** | **146** | **-** | **-** | **164** | **1,397** | **1,397** |
| **(%)** | **11.8** | **14.4** | **9.4** | **-** | **11.7** | **10.0** | **15.9** | **14.4** | **13.0** | **10.3** | **-** | **-** | **14.3** | **10.2** | **12.5** |
| T1 (%)[1] | 80.0 | 83.8 | 90.0 | - | 94.7 | 96.8 | 98.0 | 95.2 | 94.2 | 88.4 | - | - | 99.4 | 93.6 | |
| T1a (%)[1] | 13.3 | 13.3 | 4.3 | - | 4.5 | 3.2 | 2.0 | 3.8 | 4.5 | 8.2 | - | - | - | 4.8 | |
| T1b (%)[1] | 6.7 | 2.9 | 5.7 | - | 0.8 | - | - | 1.0 | 1.3 | 2.7 | - | - | 0.6 | 1.5 | |
| T1mic (%)[1] | - | - | - | - | - | - | - | - | - | 0.7 | - | - | - | 0.1 | |
| **T2- (n)** | **18** | **84** | **79** | **-** | **127** | **93** | **92** | **111** | **394** | **143** | **-** | **-** | **125** | **1,266** | **1,266** |
| **(%)** | **14.2** | **11.5** | **10.6** | **-** | **11.2** | **9.8** | **14.9** | **15.4** | **11.0** | **10.1** | **-** | **-** | **10.9** | **9.2** | **11.3** |
| T2 (%)[1] | 100.0 | 97.6 | 98.7 | - | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 98.6 | - | - | 99.2 | 99.5 | |
| T2a (%)[1] | - | 1.2 | 1.3 | - | - | - | - | - | - | - | - | - | - | 0.2 | |
| T2b (%)[1] | - | 1.2 | - | - | - | - | - | - | - | 0.7 | - | - | 0.8 | 0.2 | |
| T2c (%)[1] | - | - | - | - | - | - | - | - | - | 0.7 | - | - | - | 0.1 | |
| **T3- (n)** | **57** | **256** | **266** | **-** | **466** | **343** | **252** | **310** | **1,438** | **543** | **-** | **-** | **405** | **4,336** | **4,336** |
| **(%)** | **44.9** | **35.2** | **35.8** | **-** | **41.2** | **36.0** | **40.8** | **43.1** | **40.0** | **38.2** | **-** | **-** | **35.4** | **31.6** | **38.8** |
| T3 (%)[1] | 98.2 | 100.0 | 92.5 | - | 99.8 | 99.7 | 100.0 | 98.1 | 99.9 | 100.0 | - | - | 100.0 | 99.3 | |
| T3a (%)[1] | 1.8 | - | 1.5 | - | 0.2 | - | - | 0.6 | 0.1 | - | - | - | - | 0.2 | |
| T3b (%)[1] | - | - | 3.4 | - | - | 0.3 | - | 1.0 | - | - | - | - | - | 0.3 | |
| T3c (%)[1] | - | - | 2.6 | - | - | - | - | 0.3 | - | - | - | - | - | 0.2 | |
| **T4- (n)** | **14** | **118** | **119** | **-** | **223** | **153** | **88** | **128** | **576** | **164** | **-** | **-** | **201** | **1,784** | **1,784** |
| **(%)** | **11.0** | **16.2** | **16.0** | **-** | **19.7** | **16.1** | **14.2** | **17.8** | **16.0** | **11.5** | **-** | **-** | **17.6** | **13.0** | **16.0** |
| T4 (%)[1] | 14.3 | 15.3 | 58.0 | - | 53.4 | 45.8 | 46.6 | 74.2 | 50.0 | 42.1 | - | - | 100.0 | 54.5 | |
| T4a (%)[1] | 50.0 | 67.8 | 28.6 | - | 33.6 | 39.9 | 40.9 | 16.4 | 38.0 | 40.2 | - | - | - | 33.6 | |
| T4b (%)[1] | 35.7 | 16.9 | 13.4 | - | 13.0 | 14.4 | 12.5 | 9.4 | 12.0 | 17.7 | - | - | - | 11.9 | |
| TX (n) | 1 | 107 | 2 | - | 175 | 5 | 1 | 57 | 12 | 1 | - | - | 232 | 593 | 593 |
| (%) | 0.8 | 14.7 | 0.3 | - | 15.5 | 0.5 | 0.2 | 7.9 | 0.3 | 0.1 | - | - | 20.3 | 4.3 | 5.3 |
| Tis (n) | - | 2 | 71 | - | - | 161 | - | - | 107 | 1 | - | - | 2 | 344 | 344 |
| (%) | - | 0.3 | 9.5 | - | - | 16.9 | - | - | 3.0 | 0.1 | - | - | 0.2 | 2.5 | 3.1 |
| Unknown (n) | 21 | 42 | 132 | 210 | - | 97 | 83 | 2 | 567 | 416 | 1,814 | 533 | 5 | 3,922 | 1,365 |
| (%) | 16.5 | 5.8 | 17.7 | 100.0 | - | 10.2 | 13.4 | 0.3 | 15.8 | 29.3 | 100.0 | 100.0 | 0.4 | 28.6 | 12.2 |

(%) column percentage of total n

(%)[1] column percentage per n of pT-code (T1 -T4)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(216) = 1.2e+04, p<0.0001

EMH chi2(84) = 7.0e+03, p<0.00001 (collapsed to main categories)

Table 31: Colorectal cancer: distribution of pN-codes (TNM) by registration unit (n=13,738)

| pN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| N0 (n) | 59 | 317 | 310 | - | 516 | 398 | 273 | 340 | 1,492 | 544 | - | - | 465 | 4,714 | 4,714 |
| (%) | 46.5 | 43.5 | 41.7 | - | 45.6 | 41.8 | 44.2 | 47.2 | 41.5 | 38.3 | - | - | 40.7 | 34.3 | 42.2 |
| **N1- (n)** | **37** | **119** | **134** | **-** | **241** | **160** | **101** | **117** | **671** | **218** | **-** | **-** | **195** | **1,993** | **1,993** |
| **(%)** | **29.1** | **16.3** | **18.0** | **-** | **21.3** | **16.8** | **16.3** | **16.3** | **18.7** | **15.3** | **-** | **-** | **17.0** | **14.5** | **17.8** |
| N1 (%)[1] | 5.4 | 16.0 | 45.5 | - | 43.2 | 40.0 | 46.5 | 69.2 | 50.2 | 38.5 | - | - | 93.8 | 49.3 | |
| N1a (%)[1] | 45.9 | 34.5 | 23.1 | - | 25.3 | 24.4 | 21.8 | 7.7 | 19.8 | 28.0 | - | - | 3.1 | 21.1 | |
| N1b (%)[1] | 37.8 | 47.1 | 24.6 | - | 23.2 | 30.0 | 31.7 | 17.1 | 25.5 | 32.1 | - | - | 3.1 | 25.4 | |
| N1c (%)[1] | 10.8 | 2.5 | 5.2 | - | 8.3 | 5.6 | - | 6.0 | 4.5 | 1.4 | - | - | - | 4.2 | |
| N1mi(%)[1] | - | - | 1.5 | - | - | - | - | - | - | - | - | - | - | 0.1 | |
| **N2- (n)** | **10** | **87** | **85** | **-** | **161** | **119** | **113** | **152** | **530** | **180** | **-** | **-** | **144** | **1,581** | **1,581** |
| **(%)** | **7.9** | **12.0** | **11.4** | **-** | **14.2** | **12.5** | **18.3** | **21.1** | **14.7** | **12.7** | **-** | **-** | **12.6** | **11.5** | **14.1** |
| N2 (%)[1] | - | 3.4 | 61.2 | - | 44.7 | 56.3 | 46.9 | 70.4 | 46.0 | 37.2 | - | - | 98.6 | 51.0 | |
| N2a (%)[1] | 20.0 | 42.5 | 15.3 | - | 24.2 | 20.2 | 21.2 | 9.2 | 22.3 | 27.2 | - | - | 0.7 | 20.3 | |
| N2b (%)[1] | 80.0 | 54.0 | 23.5 | - | 31.1 | 23.5 | 31.9 | 20.4 | 31.7 | 35.6 | - | - | 0.7 | 28.7 | |
| N3 (n) | - | - | - | - | - | - | - | - | 2 | - | - | - | - | 2 | 2 |
| (%) | - | - | - | - | - | - | - | - | 0.1 | - | - | - | - | 0.01 | 0.02 |
| NX (n) | - | 163 | 34 | - | 213 | 2 | - | 109 | 16 | - | - | - | 335 | 872 | 872 |
| (%) | - | 22.4 | 4.6 | - | 18.8 | 0.2 | - | 15.1 | 0.5 | - | - | - | 29.3 | 6.4 | 7.8 |
| Unknown (n) | 21 | 42 | 181 | 210 | - | 274 | 131 | 2 | 883 | 480 | 1,814 | 533 | 5 | 4,576 | 2,019 |
| (%) | 16.5 | 5.8 | 24.3 | 100.0 | - | 28.8 | 21.2 | 0.3 | 24.6 | 33.8 | 100.0 | 100.0 | 0.4 | 33.3 | 18.1 |

(%) column percentage of total n

(%)[1] column percentage per n of pN-code (N1-N2)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(132) = 9.6e+03, p<0.0001

EMH chi2(60) = 6.0e+03, p<0.00001 (collapsed to main categories)

Table 32: Colorectal cancer: distribution of pM-codes (TNM) by registration unit (n=13,738)

| pM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 | 11,181 |
| M0 (n) | 83 | 9 | 3 | - | 2 | 1 | - | 27 | 11 | 6 | - | - | 5 | 147 | 147 |
| (%) | 65.4 | 1.2 | 0.4 | - | 0.2 | 0.1 | - | 3.8 | 0.3 | 0.4 | - | - | 0.4 | 1.1 | 1.3 |
| **M1- (n)** | **22** | **45** | **69** | **-** | **74** | **65** | **79** | **98** | **181** | **133** | **-** | **-** | **113** | **879** | **879** |
| **(%)** | **17.3** | **6.2** | **9.3** | **-** | **6.5** | **6.8** | **12.8** | **13.6** | **5.0** | **9.4** | **-** | **-** | **9.9** | **6.4** | **7.9** |
| M1 (%)[1] | 9.1 | 37.8 | 73.9 | - | 73.0 | 64.6 | 46.8 | 100.0 | 37.6 | 43.6 | - | - | 92.9 | 60.5 | |
| M1a (%)[1] | 50.0 | 24.4 | 11.6 | - | 13.5 | 18.5 | 31.6 | 0.0 | 30.9 | 27.8 | - | - | 2.7 | 19.7 | |
| M1b (%)[1] | 40.9 | 37.8 | 14.5 | - | 13.5 | 16.9 | 21.5 | 0.0 | 31.5 | 28.6 | - | - | 4.4 | 19.8 | |
| MX (n) | - | 627 | 219 | - | 1,055 | - | - | 595 | 1 | - | - | - | 1,026 | 3,523 | 3,523 |
| (%) | - | 86.1 | 29.4 | - | 93.3 | - | - | 82.6 | 0.03 | - | - | - | 89.7 | 25.6 | 31.5 |
| Unknown (n) | 22 | 47 | 453 | 210 | - | 887 | 539 | - | 3,401 | 1,283 | 1,814 | 533 | - | 9,189 | 6,632 |
| (%) | 17.3 | 6.5 | 60.9 | 100.0 | - | 93.1 | 87.2 | - | 94.6 | 90.2 | 100.0 | 100.0 | - | 66.9 | 59.3 |

(%) column percentage of total n

(%)[1] column percentage per n of pM-code (M1)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(60) = 1.7e+04, p<0.0001

EMH chi2(60) = 1.3e+04, p<0.00001

### 3.2.3 Date of diagnosis and treatment data

Table 33 presents the distribution of the date of diagnosis by registration unit. The distribution of date of CRC diagnosis differed moderately between the registries. The second quarter of the year was the most frequently recorded (26%), followed by the fourth and the first (25% both), and the third quarter (24% both). The observed small seasonal variation across the units was statistically non-significant (p=0.110), also when controlling for sex, age and year of diagnosis (p=0.105). Assignments of the month November as the date of first event varied the most between the registries (7-14%), followed by assignments of February and May the (5-11% and 5-10%, respectively). However, the observed differences were of no statistical significance (p=0.334), also when controlling for the covariates (p=0.500). Stratified cross-tabulations for each covariate separately also led to statistically non-significant results.

Table 33: Colorectal cancer: distribution of date of diagnosis by registration unit (n=13,738)

| Date of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| ***1st quarter (%)*** | ***27.6*** | ***23.1*** | ***25.7*** | ***23.3*** | ***23.8*** | ***24.9*** | ***26.2*** | ***28.1*** | ***26.6*** | ***25.4*** | ***23.8*** | ***22.3*** | ***25.5*** | ***25.3*** |
| January (%) | 7.1 | 8.1 | 9.4 | 8.1 | 6.7 | 7.2 | 8.9 | 9.7 | 9.4 | 9.6 | 8.3 | 7.5 | 8.0 | 8.6 |
| February (%) | 11.0 | 6.5 | 7.3 | 5.2 | 8.0 | 9.1 | 9.2 | 7.9 | 8.7 | 6.8 | 8.3 | 6.2 | 9.1 | 8.1 |
| March (%) | 9.5 | 8.5 | 9.0 | 10.0 | 9.1 | 8.5 | 8.1 | 10.4 | 8.4 | 8.9 | 7.2 | 8.6 | 8.5 | 8.6 |
| ***2nd quarter (%)*** | ***21.3*** | ***28.2*** | ***26.5*** | ***30.5*** | ***26.7*** | ***26.3*** | ***24.0*** | ***25.6*** | ***23.9*** | ***26.2*** | ***25.8*** | ***26.3*** | ***26.8*** | ***25.7*** |
| April (%) | 8.7 | 7.0 | 8.7 | 10.0 | 9.2 | 8.9 | 8.3 | 8.6 | 7.5 | 8.1 | 9.0 | 7.5 | 7.1 | 8.2 |
| Mai (%) | 4.7 | 10.3 | 9.7 | 10.0 | 8.6 | 9.6 | 7.6 | 8.3 | 8.2 | 9.4 | 8.2 | 10.1 | 9.8 | 8.8 |
| June (%) | 7.9 | 10.9 | 8.1 | 10.5 | 8.9 | 7.9 | 8.1 | 8.6 | 8.3 | 8.7 | 8.7 | 8.6 | 10.0 | 8.7 |
| ***3rd quarter (%)*** | ***21.3*** | ***22.9*** | ***23.9*** | ***23.8*** | ***24.0*** | ***25.5*** | ***26.1*** | ***23.1*** | ***24.0*** | ***26.4*** | ***24.8*** | ***24.6*** | ***20.9*** | ***24.2*** |
| July (%) | 7.1 | 7.4 | 9.0 | 7.6 | 8.5 | 8.7 | 8.3 | 8.9 | 8.6 | 8.4 | 10.1 | 9.4 | 6.8 | 8.6 |
| August (%) | 8.7 | 8.0 | 6.2 | 6.7 | 8.3 | 7.5 | 10.2 | 6.9 | 7.6 | 9.0 | 6.7 | 7.9 | 6.9 | 7.7 |
| September (%) | 5.5 | 7.6 | 8.7 | 9.5 | 7.2 | 9.3 | 7.6 | 7.2 | 7.9 | 9.0 | 8.0 | 7.3 | 7.2 | 8.0 |
| ***4th quarter (%)*** | ***29.9*** | ***25.8*** | ***23.9*** | ***22.4*** | ***25.6*** | ***23.3*** | ***23.8*** | ***23.3*** | ***25.5*** | ***21.9*** | ***25.6*** | ***26.8*** | ***26.8*** | ***24.9*** |
| October (%) | 9.5 | 7.8 | 8.2 | 6.2 | 9.3 | 7.7 | 7.8 | 6.3 | 8.4 | 6.9 | 8.5 | 8.6 | 8.9 | 8.1 |
| November (%) | 14.2 | 9.1 | 8.9 | 8.6 | 8.2 | 7.6 | 8.4 | 7.2 | 8.8 | 7.5 | 9.2 | 9.0 | 9.4 | 8.6 |
| December (%) | 6.3 | 8.9 | 6.9 | 7.6 | 8.1 | 8.1 | 7.6 | 9.9 | 8.4 | 7.6 | 7.9 | 9.2 | 8.5 | 8.2 |

(%) column percentage

| | | |
|---|---|---|
| Quarters: | Pearson chi2(36) = 46.66, p=0.110 | EMH chi2(36) = 46.91, p=0.105 |
| Months: | Pearson chi2(132) = 138.42, p=0.334 | EMH chi2(132) = 131.31, p=0.500 |

Table 34 presents the distribution of treatment data by registration unit. Information on treatments represented level 2 data, which meant that the registries could, at their discretion, transmit such information to NICER. **Units a**, **d**, **h**, **k** and **l** did not provide any treatment data. (Units d, k and l did not also provide information on mode of detection, histological grade and TNM stage; additionally **unit h** on mode of detection). Nevertheless, treatment data were provided by eight registration units and for 49% of all colorectal cancer diagnoses. The average treatment number per diagnosis ranged from 0.3 to 2.7 between the registries, with 0.8 treatments overall. **Units c, e, f, g and m** had treatment information for almost all of their CRC diagnoses (92-95%), **units b and j** for respectively 88% and 74% and **unit i** only for 22% (p<0.0001). Among all registries which provided treatment data, information was limited to the first treatment in 28% of all cases, to two treatments in 14%, to three treatments in 5%, to four treatments in 2% and to five treatments in 2%. **Units b, c, e, f, g and j** had data up to the fifth treatment of patients, **unit i** up to the fourth and **unit m** only on the first treatment. The results remained statistically significant when controlling for sex, age and year of diagnosis (p<0.0001).

Table 34: Colorectal cancer: distribution of treatment data by registration unit (n=13,738)

| Treatment | Registation unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 127 | 728 | 744 | 210 | 1,131 | 953 | 618 | 720 | 3,594 | 1,422 | 1,814 | 533 | 1,144 | 13,738 |
| No treatment data (n) | 127 | 91 | 55 | 210 | 71 | 44 | 39 | 720 | 2,802 | 364 | 1,814 | 533 | 92 | 6,962 |
| (%) | 100.0 | 12.5 | 7.4 | 100.0 | 6.3 | 4.6 | 6.3 | 100.0 | 78.0 | 25.6 | 100.0 | 100.0 | 8.0 | 50.7 |
| Treatment data (n) | - | 637 | 689 | - | 1,060 | 909 | 579 | - | 792 | 1,058 | - | - | 1,052 | 6,776 |
| (%) | - | 87.5 | 92.6 | - | 93.7 | 95.4 | 93.7 | - | 22.0 | 74.4 | - | - | 92.0 | 49.3 |
| Average treatment number per case | | 1.3 | *1.5* | | *2.7* | 1.5 | 1.6 | | 0.3 | 1.2 | | | 0.9 | 0.8 |
| ***1st treatment (n)*** | **-** | **398** | **382** | **-** | **90** | **535** | **288** | **-** | **588** | **563** | **-** | **-** | **1,052** | **3,896** |
| ***(%)*** | **-** | **54.7** | **51.3** | **-** | **8.0** | **56.1** | **46.6** | **-** | **16.4** | **39.6** | **-** | **-** | **92.0** | **28.4** |
| ***2nd treatment (n)*** | **-** | **175** | **213** | **-** | **471** | **279** | **190** | **-** | **175** | **346** | **-** | **-** | **-** | **1,849** |
| ***(%)*** | **-** | **24.0** | **28.6** | **-** | **41.6** | **29.3** | **30.7** | **-** | **4.9** | **24.3** | **-** | **-** | **-** | **13.5** |
| ***3rd treatment (n)*** | **-** | **54** | **75** | **-** | **207** | **83** | **71** | **-** | **23** | **101** | **-** | **-** | **-** | **614** |
| ***(%)*** | **-** | **7.4** | **10.1** | **-** | **18.3** | **8.7** | **11.5** | **-** | **0.6** | **7.1** | **-** | **-** | **-** | **4.5** |
| ***4th treatment (n)*** | **-** | **8** | **16** | **-** | **99** | **10** | **26** | **-** | **6** | **46** | **-** | **-** | **-** | **211** |
| ***(%)*** | **-** | **1.1** | **2.2** | **-** | **8.8** | **1.1** | **4.2** | **-** | **0.2** | **3.2** | **-** | **-** | **-** | **1.5** |
| ***5th treatment (n)*** | **-** | **2** | **3** | **-** | **193** | **2** | **4** | **-** | **-** | **2** | **-** | **-** | **-** | **206** |
| ***(%)*** | **-** | **0.3** | **0.4** | **-** | **17.1** | **0.2** | **0.7** | **-** | **-** | **0.1** | **-** | **-** | **-** | **1.5** |

(%) column percentage Pearson chi2(60) = 1.4e+04, p<0.0001 EMH chi2(60) = 1.4e+04, p<0.00001

## 3.3 Breast cancer – outcome variables

### 3.3.1 Topography, morphology, mode of detection and basis of diagnosis

The ICD-O-3 ***topography codes*** for breast cancer (n=20,804) were sex-specifically distributed and applied only to a small male proportion (n=150). To assign topography codes to a male breast is more difficult than to a female breast. As a result, the proportion of non-specific coding of topography (C50.9) was more than twice as high for men as for women (54% and 23%, respectively; p<0.0001). The code C50.1 'central portion' was also much more frequently recorded for men than for women (24% and 4%, respectively). In contrast, assignments of the code C50.8 'overlapping lesion' were twice as high for women as for men (22% and 10%, respectively). Non-specific coding of topography increased with the age of patients, with a proportion of 33% in the 85+ age group compared with 21-26% in patients younger up to age 84. The proportion of C50.8 'overlapping lesion' decreased from 25% (age <55) to 19% (age 85+) and that of C50.4 'upper-outer quadrant' from 31% (age <55) to 25% (age 85+). These results suggest that the very elderly were rather non-specifically coded. The remaining topographical codes hardly varied with age (p<0.0001). The proportion of non-specific topography coding declined steadily from 28% to 16% during 2008-11 but rose again to 28% in 2012. In contrast, the coding of C50.8 'overlapping lesion' and C50.4 'upper-outer quadrant' rose during 2008-11 and declined in 2012. Non-specific coding of topography varied from 2% in **unit m** to 57% in **unit i** (table 35). Separate analysis of the distribution of topography codes by year of diagnosis for the registration **unit i** revealed that the proportion of code C50.9 'breast, unspecified' almost doubled to 78% in 2012 ($\chi^2(32) = 386.43$; p<0.0001). These results indicate an improvement in coding during 2008-2011, i.e. a more precise coding. All reaming codes did not substantially differ during the observation period (p<0.0001). The registration units (table 35) recorded most frequently C50.4 'upper-outer quadrant' (30%), followed by C50.9 'breast, unspecified' (24%) and C50.8 'overlapping lesion' (22%). The range of the corresponding frequencies in the registries was wide (19-55%; p<0.0001). The proportions of the topographical codes remained statistically significantly different when controlling for sex, age and year of diagnosis (p<0.00001).

The ICD-O-3 ***morphology codes*** differed negligibly between the sexes, except for category 'ductal, lobular and medullary neoplasms', which was the most frequently recorded for men (88%) and women (93%; p=0.001). The proportions of category 'ductal, lobular and medullary neoplasms' decreased with age of patients, from 95% (age <55) to 79% (age 85+). In contrast, non-specific coding of morphology was more common among older (13% in the age group 85+) than among younger patients (0.5-2.6% in patients younger up to age 84). This pattern supports the assumption of elderly patients being rather non-specifically coded. The proportions of remaining categories varied only slightly with age (p<0.0001). All morphology codes hardly varied with increasing year of diagnosis. However, the proportion of non-specific coding of morphology declined steadily from 2.1% to 1.5% during 2008-11 but rose again to 1.2% in 2012 (p=0.047). This pattern is similar to the already observed with the outcome variable topography and supports the assumption of an improvement in coding until 2011. The registration units (table 36) assigned most frequently category 'ductal, lobular and medullary neoplasms' (93%), in a narrow range between the registries (89-96%). The proportions of non-specific coding, denoted as 'other, unspecified', accounted only for 2% of all cases and ranged from 0.6% in **unit h** to 4.4% **in unit a**. The proportions of all remaining morphological categories hardly varied between the units (p<0.0001). These results remained statistically significant when controlling for sex, age, year of diagnosis, *screening and mode of detection* (p<0.00001). The detection method of ductal, lobular and medullary neoplasms was primarily unknown (51%), followed by general screening methods (22%), mammography as opportunistic screening (10%), tumour symptoms (8%), mammography as systematic screening (5%) and incidental findings (4%). The detection method of unspecified neoplasms (non-specific coding) was also primarily unknown (56%), followed by tumour symptoms (15%), incidental findings (10%), general screening methods (9%), opportunistic mammography (3%) and systematic mammography (1%; $\chi^2(36) = 670.33$; p<0.0001).

The ***method of first detection of tumour*** represented level 2 information. To provide NICER with such information was not mandatory. **Units d, h, k and l** did not transmit data on the mode of detection to NICER. Therefore, their breast cancer diagnoses were excluded from the analyses of the distribution of codes ***by registration unit***. The codes varied moderately by sex (p<0.0001). Breast cancer in men was detected almost twice as frequently by tumour symptoms as in women (17% and 9%, respectively). Detection by general screening methods was 24% in men and 22% in women. As expected, detection of breast cancer with mammography as both opportunistic and systematic screening was the highest among women (10% and 5%, respectively). The proportions of screen-detected breast cancer declined with increasing age of patients.. As a result, the proportions of both opportunistic and systematic screening were the highest in the 55-64 (11.7% and 9.3%, respectively) and 65-74 age group (12.1% and 7.8%, respectively). By comparison, general screening methods (including check-ups, self palpation etc.) were more common among younger (26% in the age group <55) and older patients (23% in the age group 75-84) than among the very elderly (18% in the age group 85+). The proportions of incidental and symptomatic detection increased with age, also of unknown mode of detection (p<0.0001). The proportion of unknown mode of detection fell strongly from 72% to 37% during 2008-11 and was stable on this level in 2012. This pattern indicates a more precise coding of the detection method until 2011, which is supported by a more frequent recording of general screening methods (from 12% to 29% during 2008-12), opportunistic mammography (from 6% to 14% during 2008-12) and systematic mammography (from 4% to 7% during 2008-12). Non-specific coding of the detection method ranged from 2% in **unit f** to 66% in **unit i**. Sepa-

rate analysis of the distribution of detection codes by year of diagnosis for the registration **unit i** revealed that the proportions of the non-specific coding fell steadily during 2008-12 ($\chi^2$ (24) = 1.6e+03; p<0.0001). Additional analyses of the distribution of detection codes by year of diagnosis for all registration units with high proportions of non-specific coding revealed that **unit a** and **unit b** are responsible for the observed stagnation in 2012 ($\chi^2$ (12) = 21.29; p<0.0001). The registration units (table 37) recorded most frequently that the detection method was unknown (36%), followed by general screening methods (28), mammography as opportunistic screening (13%), tumour symptoms (12%) and mammography as systematic screening (7%, p<0.0001). The range of the corresponding frequencies in the registries was wide (21-64%). The proportions of systematic mammography screening ranged from 3% to 33% between the registries which provided information on the detection mode within an implemented cantonal screening programme (registries a, c, f, g, j and m). **Unit g**, which had the lowest records for systematic mammography, had the highest proportion of general screening methods among all units (52%), followed by opportunistic mammography screening (30%). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *screening* (p<0.00001).

The ***basis of diagnosis codes*** differed negligibly between the sexes (p=0.082), with almost equal proportions in category 'histology of primarily tumour', which was assigned in 98% of all cases. The proportion of 'histology of primary tumour' fell steadily with increasing age of patients, from 99% (age <55) to 86% (age 85+). By comparison, the proportions of the categories 'clinical', 'clinical investigation' and DCO increased primarily in the 85+ age group (p<0.0001). All codes hardly differed by year of diagnosis (p<0.0001). However, assignments of the code 'histology of primary tumour' rose slightly by 1% to 98% during the observation period. All cancer registries had well differentiated records of the microscopic proportion (cytology, histology of metastasis and histology of primary tumour), since it represents an international quality criterion (table 38). Therefore, non-specific coding of basis of diagnosis resulted only in 0.1% of all cases (p<0.0001). The proportions of codes remained statistically significantly different when controlling for sex, age, year of diagnosis *and screening* (p<0.00001).

Table 35: Breast cancer: distribution of ICD-O-3 topography codes by registration unit (n=20,804)

| Topography code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| C50.0 Nipple and areola (n) | 1 | 8 | 6 | 3 | 9 | 2 | 1 | 2 | 10 | 2 | 23 | 6 | 12 | 85 |
| (%) | 0.5 | 0.8 | 0.6 | 1.0 | 0.5 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.8 | 0.9 | 0.6 | 0.4 |
| C50.1 Central portion (n) | 16 | 24 | 48 | 12 | 76 | 98 | 30 | 1 | 134 | 120 | 113 | 24 | 103 | 799 |
| (%) | 7.8 | 2.3 | 4.5 | 3.9 | 4.5 | 7.3 | 3.4 | 0.1 | 2.3 | 6.4 | 4.0 | 3.6 | 5.0 | 3.8 |
| C50.2 Upper-inner quadrant (n) | 20 | 117 | 91 | 25 | 151 | 155 | 100 | 113 | 310 | 208 | 260 | 68 | 205 | 1,823 |
| (%) | 9.8 | 11.4 | 8.5 | 8.2 | 8.9 | 11.6 | 11.3 | 10.4 | 5.4 | 11.2 | 9.2 | 10.2 | 9.9 | 8.8 |
| C50.3 Lower-inner quadrant (n) | 9 | 41 | 44 | 14 | 100 | 79 | 41 | 59 | 142 | 88 | 148 | 33 | 132 | 930 |
| (%) | 4.4 | 4.0 | 4.1 | 4.6 | 5.9 | 5.9 | 4.6 | 5.4 | 2.5 | 4.7 | 5.2 | 4.9 | 6.4 | 4.5 |
| C50.4 Upper-outer quadrant (n) | 75 | 306 | 386 | 116 | 553 | 489 | 288 | 306 | 1,124 | 586 | 940 | 257 | 745 | 6,171 |
| (%) | 36.6 | 29.9 | 36.0 | 38.0 | 32.5 | 36.5 | 32.5 | 28.2 | 19.6 | 31.4 | 33.1 | 38.4 | 36.0 | 29.7 |
| C50.5 Lower-outer quadrant (n) | 19 | 84 | 67 | 32 | 114 | 117 | 81 | 89 | 248 | 144 | 184 | 66 | 172 | 1,417 |
| (%) | 9.3 | 8.2 | 6.2 | 10.5 | 6.7 | 8.7 | 9.2 | 8.2 | 4.3 | 7.7 | 6.5 | 9.9 | 8.3 | 6.8 |
| C50.6 Axillary tail (n) | 1 | 1 | - | 1 | 3 | 5 | 1 | - | 17 | 1 | 6 | 3 | 8 | 47 |
| (%) | 0.5 | 0.1 | - | 0.3 | 0.2 | 0.4 | 0.1 | - | 0.3 | 0.1 | 0.2 | 0.5 | 0.4 | 0.2 |
| C50.8 Overlapping lesion (n) | 44 | 341 | 364 | 83 | 376 | 350 | 85 | 97 | 470 | 570 | 1,038 | 175 | 649 | 4,642 |
| (%) | 21.5 | 33.3 | 33.9 | 27.2 | 22.1 | 26.1 | 9.6 | 8.9 | 8.2 | 30.6 | 36.6 | 26.1 | 31.3 | 22.3 |
| C50.9 Breast, unspecified (n) | 20 | 102 | 67 | 19 | 319 | 44 | 258 | 420 | 3,284 | 146 | 128 | 38 | 45 | 4,890 |
| (%) | 9.8 | 10.0 | 6.2 | 6.2 | 18.8 | 3.3 | 29.2 | 38.6 | 57.2 | 7.8 | 4.5 | 5.7 | 2.2 | 23.5 |

(%) column percentage Pearson chi2(96) = 6.6e+03, p<0.0001 EMH chi2(96) = 2.3e+03, p<0.00001

Table 36: Breast cancer: distribution of ICD-O-3 morphology codes by registration unit (n=20,804)

| Morphology code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| Squamous cell neoplasms (n) | - | 2 | 9 | - | - | 3 | 2 | 3 | 6 | - | 8 | 1 | 2 | 36 |
| (%) | - | 0.2 | 0.8 | - | - | 0.2 | 0.2 | 0.3 | 0.1 | - | 0.3 | 0.2 | 0.1 | 0.2 |
| Adenomas / adenocarcinomas (n) | 1 | 50 | 17 | 5 | 67 | 45 | 6 | 23 | 161 | 29 | 116 | 9 | 31 | 560 |
| (%) | 0.5 | 4.9 | 1.6 | 1.6 | 3.9 | 3.4 | 0.7 | 2.1 | 2.8 | 1.6 | 4.1 | 1.3 | 1.5 | 2.7 |
| Cystic, mucinous and serous (n) | 7 | 11 | 11 | 3 | 26 | 9 | 6 | 21 | 92 | 11 | 68 | 22 | 40 | 327 |
| neoplasms (%) | 3.4 | 1.1 | 1.0 | 1.0 | 1.5 | 0.7 | 0.7 | 1.9 | 1.6 | 0.6 | 2.4 | 3.3 | 1.9 | 1.6 |
| Ductal, lobular and medullary (n) | 187 | 913 | 1,019 | 292 | 1,564 | 1,227 | 840 | 1,018 | 5,349 | 1,784 | 2,561 | 627 | 1,950 | 19,331 |
| neoplasms (%) | 91.2 | 89.2 | 95.0 | 95.7 | 92.0 | 91.6 | 94.9 | 93.7 | 93.2 | 95.7 | 90.2 | 93.6 | 94.2 | 92.9 |
| Complex epithelial neoplasms (n) | 1 | 4 | 4 | 1 | 5 | 7 | 7 | 8 | 17 | 5 | 11 | 1 | 4 | 75 |
| (%) | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 | 0.5 | 0.8 | 0.7 | 0.3 | 0.3 | 0.4 | 0.2 | 0.2 | 0.4 |
| Other, specified (n) | - | 3 | 4 | 1 | 6 | 4 | 4 | 7 | 27 | 7 | 10 | - | 6 | 79 |
| (%) | - | 0.3 | 0.4 | 0.3 | 0.4 | 0.3 | 0.5 | 0.6 | 0.5 | 0.4 | 0.4 | - | 0.3 | 0.4 |
| Other, unspecified (n) | 9 | 41 | 9 | 3 | 33 | 44 | 20 | 7 | 87 | 29 | 66 | 10 | 38 | 396 |
| (%) | 4.4 | 4.0 | 0.8 | 1.0 | 1.9 | 3.3 | 2.3 | 0.6 | 1.5 | 1.6 | 2.3 | 1.5 | 1.8 | 1.9 |

(%) column percentage

Pearson chi2(72) = 297.87, p<0.0001 EMH chi2(48) = 252.71, p<0.00001 (collapsed: other specified, squamous cell and complex epithelial neoplasms)

Table 37: Breast cancer: method of 1st detection of tumour by registration unit (n=20,804)

| Detection | Registration unit[1] | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 15,902 |
| Symptoms (n) | 14 | 84 | 214 | - | 454 | 150 | 81 | - | 354 | 245 | - | - | 187 | 1,783 | 1,783 |
| (%) | 6.8 | 8.2 | 19.9 | - | 26.7 | 11.2 | 9.2 | - | 6.2 | 13.1 | - | - | 9.0 | 8.6 | 11.2 |
| Incidental (n) | 2 | 67 | 25 | - | 42 | 37 | 69 | - | 96 | 323 | - | - | 121 | 782 | 782 |
| (%) | 1.0 | 6.5 | 2.3 | - | 2.5 | 2.8 | 7.8 | - | 1.7 | 17.3 | - | - | 5.8 | 3.8 | 4.9 |
| Screening (n) | 21 | 453 | 403 | - | 301 | 601 | 459 | - | 907 | 558 | - | - | 773 | 4,476 | 4,476 |
| (%) | 10.2 | 44.2 | 37.6 | - | 17.7 | 44.9 | 51.9 | - | 15.8 | 29.9 | - | - | 37.3 | 21.5 | 28.1 |
| Mammography as opportunistic screening (n) | 6 | 134 | 134 | - | - | 196 | 203 | - | 548 | 136 | - | - | 657 | 2,014 | 2,014 |
| (%) | 2.9 | 13.1 | 12.5 | - | - | 14.6 | 22.9 | - | 9.6 | 7.3 | - | - | 31.7 | 9.7 | 12.7 |
| Mammography as systematic screening (n) | 61 | 7 | 256 | - | - | 325 | 30 | - | 4 | 171 | - | - | 252 | 1,106 | 1,106 |
| (%) | 29.8 | 0.7 | 23.9 | - | - | 24.3 | 3.4 | - | 0.1 | 9.2 | - | - | 12.2 | 5.3 | 7.0 |
| Other (n) | 4 | 4 | - | - | - | - | - | - | 17 | 14 | - | - | 5 | 44 | 44 |
| (%) | 2.0 | 0.4 | - | - | - | - | - | - | 0.3 | 0.8 | - | - | 0.2 | 0.2 | 0.3 |
| Unknown (n) | 97 | 275 | 41 | 305 | 904 | 30 | 43 | 1,087 | 3,813 | 418 | 2,840 | 670 | 76 | 10,599 | 5,697 |
| (%) | 47.3 | 26.9 | 3.8 | 100.0 | 53.2 | 2.2 | 4.9 | 100.0 | 66.4 | 22.4 | 100.0 | 100.0 | 3.7 | 51.0 | 35.8 |

(%) column percentage Pearson chi2(72) = 1.5e+04, p<0.0001 EMH chi2(72) = 1.3e+04, p<0.00001

[1] registration units with mammography screening programme during observation period: a, c, d, f, g, j, k, l, m

[2] registration units with records only, i.e. units d, h, k and l excluded

Table 38: Breast cancer: distribution of basis of diagnosis codes by registration unit (n=20,804)

| Basis of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| DCO (n) | 2 | 17 | - | - | 2 | - | 1 | - | 53 | - | 23 | - | 5 | 103 |
| (%) | 1.0 | 1.7 | - | - | 0.1 | - | 0.1 | - | 0.9 | - | 0.8 | - | 0.2 | 0.5 |
| Clinical (n) | 1 | 2 | 2 | 1 | 3 | 12 | 3 | - | 14 | 11 | 23 | 5 | 6 | 83 |
| (%) | 0.5 | 0.2 | 0.2 | 0.3 | 0.2 | 0.9 | 0.3 | - | 0.2 | 0.6 | 0.8 | 0.8 | 0.3 | 0.4 |
| Clinical investigation (n) | 4 | 8 | 4 | - | 6 | 7 | 2 | 1 | 9 | 8 | - | - | 5 | 54 |
| (%) | 2.0 | 0.8 | 0.4 | - | 0.4 | 0.5 | 0.2 | 0.1 | 0.2 | 0.4 | - | - | 0.2 | 0.3 |
| Tumour markers (n) | - | - | - | - | - | - | 4 | - | - | - | - | - | - | 4 |
| (%) | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | 0.0 |
| Cytology (n) | 1 | 1 | 34 | - | 18 | 6 | 1 | 6 | 34 | 22 | 4 | 6 | 5 | 138 |
| (%) | 0.5 | 0.1 | 3.2 | - | 1.1 | 0.5 | 0.1 | 0.6 | 0.6 | 1.2 | 0.1 | 0.9 | 0.2 | 0.7 |
| Histology of metastasis (n) | - | 4 | 12 | 2 | 19 | 7 | 8 | 1 | 22 | 15 | 9 | 4 | - | 103 |
| (%) | - | 0.4 | 1.1 | 0.7 | 1.1 | 0.5 | 0.9 | 0.1 | 0.4 | 0.8 | 0.3 | 0.6 | - | 0.5 |
| Histology of primary tumour (n) | 197 | 983 | 1,021 | 302 | 1,653 | 1,307 | 865 | 1,079 | 5,607 | 1,808 | 2,780 | 655 | 2,050 | 20,307 |
| (%) | 96.1 | 96.0 | 95.2 | 99.0 | 97.2 | 97.6 | 97.7 | 99.3 | 97.7 | 96.9 | 97.9 | 97.8 | 99.0 | 97.6 |
| Unknown (n) | - | 9 | - | - | - | - | 1 | - | - | 1 | 1 | - | - | 12 |
| (%) | - | 0.9 | - | - | - | - | 0.1 | - | - | 0.1 | 0.0 | - | - | 0.1 |

(%) column percentage

Pearson chi2(84) = 599.13, p<0.0001 EMH chi2 (72) = 450.90, p<0.00001 (collapsed categories: tumour markers and unknown)

### 3.3.2 Grade and TNM staging

Histological grade and TNM staging information corresponded to level 2 data. The cancer registries were not obliged to provide NICER with such information. Due to missing classification information, breast cancer diagnoses of the **units d, k and l** fell into the category 'unknown' and were excluded from the analyses of the distribution of codes ***by registration unit.***

The ***histological grading codes*** for breast cancer differed negligibly between the sexes (p=0.419). Non-specific coding of histological grade rose from 23% (age 55-64) to 35% (age 85+) and confirms an age gradient, which was already observed with the outcome variables topography and morphology (p<0.0001). This finding indicates that, with regards to histological grade, cancer registrations among the very elderly were not as clearly differentiated as those among patients falling under the three prior age groups. As a consequence, the proportions of grade 1 decreased from 13% (age 65-74) to 9% (age 85+), that of grade 2 from 45% (age 75-84) to 39% (age 85+) and that of grade 3 from 28% (age <55) to 17% (age 85+). The proportions of grade X (undetermined grade) varied in a narrow range between the age groups (0.2-1.3%). All grading codes differed less than 5% with increasing year of diagnoses (p<0.0001). Nevertheless, the proportion of non-specific coding of histological grade declined steadily from 27% to 23% during 2009-12. This pattern is similar to that already observed with outcome variables topography and morphology, and supports the assumption of an improvement in coding during the observation period. Of all codes, grade 2 was the most frequently recorded (48%), within a range of 47-59% between the registries (table 39; p<0.0001). Grade 3 was the second most frequently recorded (29%) and grade 1 the third most frequently (15%). The range of the corresponding frequencies in the registries was wide (20% and 14%, respectively). Non-specific coding of histological grade ranged from 3% in **unit g** to 15% in **unit f** and was the fourth most frequently assigned code (7%). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.00001). Breast cancer assignments of grade 1, grade 2, grade 3 or unknown grade were the most frequent if the detection method was unknown (37-87%) and second most frequent in the case of general screening methods (3-31%). Breast cancer diagnoses assigned grade X were mainly detected by general screening methods (31%), followed by unknown mode of detection (27%). Further, breast cancer diagnoses assigned grade 1 or grade 2 were third most frequently detected by mammography as opportunistic screening (17% and 12%, respectively) and fourth most frequently by mammography within a cantonal programme (11% and 7%, respectively; $\chi^2$ (24) = 4.0e+03; p<0.0001).

The ***cTNM codes*** for breast cancer differed marginally between the sexes. The codes cT2, cNX and cMX became the most frequently recorded with increasing age of patients, with proportions of 18% (+10%), 21% (+11%) and 15% (+12%), respectively, in the age group 85+ (p<0.0001). In contrast, non-specific coding of the cT category decreased from 69% (age <55) to 47% (age 85+) and that of the cN category from 58% (age <55) to 42% (age 85+). However, non-specific coding of the cM category increased from 23% (age 55-64) to 38% (age 85+). Non-specific coding of the clinical TNM declined strongly during 2008-10, but the proportions rose slightly again until 2012 (p <0.0001). In contrast, the remaining cTNM categories were more frequently coded during the years in question. These results suggest an improvement in coding of cTNM until 2010. Non-specific coding of all clinical TNM categories for breast cancer was the highest if the detection method was unknown (67-93%) and the second highest for general screening methods (2-15%). Codes cTis and cT0 were the most frequently applied category for mammography both as opportunistic (57% and 30%, respectively) and systematic screening (19% and 25%, re-

spectively). Codes cT1, cT2 and cT3 were primarily assigned following detection by general screening methods (32%, 46% and 43%, respectively) and code cT4 following detection by tumour symptoms (45%; $\chi^2(42) = 6.7e+03$; $p<0.0001$). Codes cN0 and cN1 were primarily assigned if the breast cancer was detected by general screening methods (32% and 41%, respectively) and codes cN2 and cN3 in the case of tumour symptoms (38% and 43%, respectively). Further, codes cN0 and cN1 were more frequently applied than the remaining codes if the tumour was detected by mammography as both opportunistic (21% and 7%, respectively) and systematic screening (9% and 2%, respectively; $\chi^2(30) = 5.6e+03$; $p<0.0001$). Assignments of the code cM0 (absence of distant metastases) were the highest if the detection method of breast cancer was unknown (40%), followed by general screening methods (28%). Assignments of the code cM1 (presence of distant metastases) were the highest in the case of detection by tumour symptoms (40%) and that of cMX (distant metastases cannot be assessed) for general screening methods (31%). Codes cMX and cM0 were more frequently used than the remaining codes if the tumour was detected by mammography as both opportunistic (15% and 13%, respectively) and systematic screening (8% and 7%, respectively; $\chi^2(30) = 5.9e+03$; $p<0.0001$).

The ***pTNM codes*** for breast cancer differed moderately between the sexes, with proportion of the codes being statistically significant only for pT ($p<0.0001$). Non-specific coding of the pT and pN category became the most frequent assignment with increasing age of patients, with proportions of 44% (+22%) and 53% (+27%), respectively, in the age group 85+ ($p<0.0001$). Assignments of the code pTX also increased from 1% (age <55) to 12% (age 85+) and that of pNX from 4% (age <55) to 20% (age 85+). In contrast, the proportions of the codes pT1, pT2, pN0 and pN1 decreased with age and were the lowest in the age group 85+ (by 28% to 12%, by 7% to 22%, by 31% to 13% and by 12% to 8%, respectively). The pM codes differed slightly between the age groups. However, non-specific coding of the pM category decreased from 71% (age 55-64) to 68% (age 75-85), while the proportion of code pMX increased from 27% (age <55) to 30% (age 75-84). Non-specific coding of the pathological TNM declined during 2008-10, but the proportions rose slightly again until 2012 ($p <0.0001$). In contrast, the remaining pTNM categories were more frequently coded during the years in question. These results suggest a partial improvement in coding of pTNM until 2010. Non-specific coding of all clinical TNM categories for breast cancer was the highest if the detection method was unknown (57-87%). Code pTis was the most frequently applied category for mammography both as opportunistic (26%) and systematic screening (11%). The proportions of opportunistic and systematic mammography were also high with the codes pT0 and pT1. However, code pT0 was primarily used if the breast cancer was detected by general screening methods (45%) or by tumour symptoms (23%) and code pT1 if the detection mode was unknown (39%) or in the case of general screening methods (26%). Codes pT2 and pT3 were primarily assigned following unknown method of detection (42% both) and code pT4 following detection by tumour symptoms (39%; $\chi^2(42) = 6.1e+03$; $p<0.0001$). All pathological N codes were primarily assigned if the detection mode for breast cancer was unknown (38-42%) and second most frequently if the breast cancer was detected by general screening methods (21-32%). Further, codes pN0 and pN1 were more frequently applied than the remaining codes if the tumour was detected by mammography as both opportunistic (15% and 9%, respectively) and systematic screening (9% and 5%, respectively; $\chi^2(24) = 1.2e+03$; $p<0.0001$). Assignments of the code pM0 (absence of distant metastases) were the highest if the detection method of breast cancer was unknown (64%) and that of code pM1 (presence of distant metastases) in the case of detection by tumour symptoms (39%). Assignments of code pMX (distant metastases cannot be assessed) were the

highest in the case of method of detection was unknown (37%). Codes pMX and pM0 were more frequently applied than the remaining codes if the tumour was detected by mammography as both opportunistic (14% and 3%, respectively) and systematic screening (6% and 17%, respectively; $\chi^2(24) = 1.2e+03$; p<0.0001).

Tables 40-42 present the distribution of ***the cTNM codes for breast cancer by registration unit***. Less than 1% of all breast cancer diagnoses were not coded according to the clinical TNM classification, as some registries also assigned the codes 'T2a', 'T2c', 'T3c', 'Ta', 'N2c', 'M1b' and 'M1c'. **Unit b** used incorrect cTNM codes the most. Only **units a, c, f, and m** listed correct codes for the entire cTNM. All registries coded according to the 6th edition of the UICC TNM classification of malignant tumours and therefore assigned code cMX (5% overall). Registries providing information on the cT and cN categories most frequently coded non-specifically (46% and 44%, respectively). The range of the corresponding frequencies in the registries was extremely wide (92% and 89%, respectively; p<0.0001). The proportions of non-specific assignments were extremely low in **units b, h and m** (<3%), and **unit e** had even no such assignment. These units had higher proportions of the codes cTX, cNX and cMX. The proportions of non-specific assignments were the highest in **unit a** and **unit c**. Of the clinical M category codes, cM0 was the most frequently applied code (83%; p<0.0001). The corresponding proportions ranged widely between the registries (36-95%). The codes cT1, cN0 and unknown cM were the second most frequently recorded of the entire cTNM (20%, 30% and 6%, respectively) and codes cTX, cNX and cMX the third most frequently (12%, 15% and 5%, respectively). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* and *screening* (p<0.00001).

Tables 43-45 present the distribution of the ***p*TNM *codes for breast cancer by cancer registries***. Less than 1% of all breast cancer diagnoses were not coded according to the pathological TNM classification, as some registries also assigned the codes 'T1b1', 'T2a-c', 'T3b', 'N2mi' and 'M1b'. **Units c** and **e** used incorrect pTNM codes the most. Only **units a, f and j** listed correct codes for the entire pTNM. Registration **units f**, **g** and **j** coded according to the 7th edition of the UICC TNM classification of malignant tumours and therefore avoided to assign code pMX. The remaining registries coded according to the 6th edition of the UICC TNM classification of malignant tumours and applied code pMX (35% overall). Registries providing information on the pT and pN categories most frequently assigned code pT1 and pN0 (43% and 48%, respectively; p<0.0001) and second most frequently pT2 and pN1 (29% and 21%, respectively). The range of the corresponding frequencies in the registries was moderate (23% and 20%, respectively and 13% and 6%, respectively). Non-specific coding of the pT and pN categories was significantly less frequent (8% and 14%, respectively) than of the pM category (62%; p<0.0001). However, the corresponding proportions varied widely between the registries (<1-28%, <1-35% and 2-99%, respectively; p<0.0001). The proportions of non-specific assignments were extremely low in **units b, h and m** (<3%), and **unit e** had even no such assignment. These units had higher proportions of the codes pTX, pNX and pMX. The proportions of non-specific assignments were the highest in **unit g** and **unit j**. Of the pM category codes, pMX was the second most frequently applied code (34%; p<0.0001). The corresponding proportions ranged extremely widely between the registries (<1-99%). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* and *screening* (p<0.00001).

Table 39: Breast cancer: distribution of histological grading codes by registration unit (n=20,804)

| Grade | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| Grade 1 (n) | 35 | 76 | 164 | - | 303 | 257 | 95 | 156 | 677 | 254 | - | - | 440 | 2,457 | 2,457 |
| (%) | 17.1 | 7.4 | 15.3 | - | 17.8 | 19.2 | 10.7 | 14.4 | 11.8 | 13.6 | - | - | 21.3 | 11.8 | 14.5 |
| Grade 2 (n) | 100 | 477 | 629 | - | 806 | 622 | 418 | 546 | 2,762 | 942 | - | - | 1,074 | 8,376 | 8,376 |
| (%) | 48.8 | 46.6 | 58.6 | - | 47.4 | 46.5 | 47.2 | 50.2 | 48.1 | 50.5 | - | - | 51.9 | 40.3 | 49.3 |
| Grade 3 (n) | 36 | 372 | 236 | - | 522 | 236 | 332 | 282 | 1,817 | 560 | - | - | 475 | 4,868 | 4,868 |
| (%) | 17.6 | 36.3 | 22.0 | - | 30.7 | 17.6 | 37.5 | 25.9 | 31.7 | 30.0 | - | - | 22.9 | 23.4 | 28.7 |
| Grade X (n) | 5 | 2 | 1 | - | - | 18 | 12 | - | 1 | 32 | - | - | - | 71 | 71 |
| (%) | 2.4 | 0.2 | 0.1 | - | - | 1.3 | 1.4 | - | 1.0 | 32.0 | - | - | - | 0.3 | 0.4 |
| Unknown (n) | 29 | 97 | 43 | 305 | 70 | 206 | 28 | 103 | 482 | 77 | 2,840 | 670 | 82 | 5,032 | 1,217 |
| (%) | 14.2 | 9.5 | 4.0 | 100.0 | 4.1 | 15.4 | 3.2 | 9.5 | 8.4 | 4.1 | 100.0 | 100.0 | 4.0 | 24.2 | 7.2 |

(%) column percentage Pearson chi2(48) = 1.5e+04, p<0.0001 EMH chi2(48) = 3.1e+03, p<0.00001

[1] registration units with records only, i.e. units d, k and l excluded

Table 40: Breast cancer: distribution of cT-codes (TNM) by registration unit (n=20,804)

| cT-code | | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| T0 (n) | | - | 8 | 1 | - | - | 1 | 90 | 29 | - | 337 | - | - | 55 | 521 | 521 |
| (%) | | - | 0.8 | 0.1 | - | - | 0.1 | 10.2 | 2.7 | - | 18.1 | - | - | 2.7 | 2.5 | 3.1 |
| **T1- (n)** | | **32** | **327** | **18** | **-** | **530** | **21** | **376** | **393** | **86** | **480** | **-** | **-** | **955** | **3,218** | **3,218** |
| **(%)** | | **15.6** | **31.9** | **1.7** | **-** | **31.2** | **1.6** | **42.5** | **36.2** | **1.5** | **25.7** | **-** | **-** | **46.1** | **15.5** | **18.9** |
| | T1 (%)[1] | 9.4 | 21.7 | 55.5 | - | 35.5 | 19.1 | 3.7 | 79.4 | 43.0 | 33.8 | - | - | 42.7 | 37.6 | |
| | T1a (%)[1] | 6.3 | 2.8 | - | - | 3.2 | - | 3.7 | 1.3 | 1.2 | 2.1 | - | - | 5.7 | 3.5 | |
| | T1b (%)[1] | 40.6 | 21.4 | 16.7 | - | 20.2 | 9.5 | 25.3 | 4.3 | 4.7 | 13.1 | - | - | 20.4 | 17.7 | |
| | T1c (%)[1] | 43.7 | 54.1 | 27.8 | - | 41.1 | 71.4 | 67.3 | 15.0 | 51.1 | 51.0 | - | - | 31.2 | 41.2 | |
| **T2- (n)** | | **17** | **224** | **30** | **-** | **226** | **65** | **283** | **218** | **178** | **475** | **-** | **-** | **448** | **2,164** | **2,164** |
| **(%)** | | **8.3** | **21.9** | **2.8** | **-** | **13.3** | **4.9** | **32.0** | **20.1** | **3.1** | **25.5** | **-** | **-** | **21.6** | **10.5** | **12.7** |
| | T2 (%)[1] | 100.0 | 99.2 | 100.0 | - | 99.6 | 100.0 | | 99.5 | 100.0 | 99.2 | - | - | 100.0 | 99.6 | |
| | T2a (%)[1] | - | 0.4 | - | - | - | - | 0.4 | 0.5 | - | 0.2 | - | - | - | 0.2 | |
| | T2c (%)[1] | - | 0.4 | - | - | 0.4 | - | - | - | - | 0.6 | - | - | - | 0.2 | |
| **T3- (n)** | | **3** | **32** | **8** | **-** | **33** | **20** | **49** | **43** | **45** | **74** | **-** | **-** | **89** | **396** | **396** |
| **(%)** | | **1.5** | **3.1** | **0.7** | **-** | **1.9** | **1.5** | **5.5** | **4.0** | **0.8** | **4.0** | **-** | **-** | **4.3** | **1.9** | **2.3** |
| | T3 (%)[1] | 100.0 | 100.0 | 100.0 | - | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 98.6 | - | - | 100.0 | 99.7 | |
| | T3c (%)[1] | - | - | - | - | - | - | - | - | - | 1.4 | - | - | - | 0.3 | |
| **T4- (n)** | | **9** | **53** | **30** | **-** | **90** | **44** | **63** | **31** | **177** | **119** | **-** | **-** | **108** | **724** | **724** |
| **(%)** | | **4.4** | **5.2** | **2.8** | **-** | **5.3** | **3.3** | **7.1** | **2.9** | **3.1** | **6.4** | **-** | **-** | **5.2** | **3.5** | **4.3** |
| | T4 (%)[1] | 22.2 | 26.4 | 43.3 | - | 62.2 | 45.5 | 7.9 | 71.0 | 33.3 | 17.6 | - | - | 13.0 | 31.2 | |
| | T4a (%)[1] | - | 9.4 | - | - | 1.1 | 6.8 | - | - | 1.7 | 4.2 | - | - | 4.6 | 3.0 | |
| | T4b (%)[1] | 55.6 | 26.4 | 26.7 | - | 21.1 | 29.5 | 60.3 | 16.1 | 23.7 | 42.0 | - | - | 41.7 | 33.0 | |
| | T4c (%)[1] | - | 15.1 | 6.7 | - | 4.4 | 4.5 | 6.3 | 3.2 | 9.0 | 5.9 | - | - | 9.3 | 7.5 | |
| | T4d (%)[1] | 22.2 | 22.6 | 23.3 | - | 11.1 | 13.6 | 25.4 | 9.7 | 32.2 | 30.3 | - | - | 31.5 | 25.3 | |
| TX (n) | | 1 | 349 | 2 | - | 822 | 9 | 23 | 369 | 102 | 27 | - | - | 319 | 2,023 | 2,023 |
| (%) | | 0.5 | 34.1 | 0.2 | - | 48.3 | 0.7 | 2.6 | 34.0 | 1.8 | 1.5 | - | - | 15.4 | 9.7 | 11.9 |
| Ta (n) | | - | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| (%) | | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - | 0.0 | 0.0 |
| Tis (n) | | - | - | - | - | - | - | - | - | - | - | - | - | 91 | 91 | 91 |
| (%) | | - | - | - | - | - | - | - | - | - | - | - | - | 4.4 | 0.4 | 0.5 |
| Unknown (n) | | 143 | 30 | 984 | 305 | - | 1,179 | 1 | 4 | 5,151 | 353 | 2,840 | 670 | 6 | 11,666 | 7,851 |
| (%) | | 69.8 | 2.9 | 91.7 | 100.0 | - | 88.1 | 0.1 | 0.4 | 89.8 | 18.9 | 100.0 | 100.0 | 0.3 | 56.1 | 46.2 |

(%) column percentage of total n

(%)[1] column percentage per n of cT-code (T1-T4)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(216) = 2.4e+04, p<0.0001

EMH chi2(72) = 1.6e+04, p<0.00001 (collapsed to main categories)

## Table 41: Breast cancer: distribution of cN-codes (TNM) by registration unit (n=20,804)

| cN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| N0 (n) | 39 | 416 | 47 | - | 382 | 105 | 433 | 426 | 447 | 1,064 | - | - | 1,552 | 4,911 | 4,911 |
| (%) | 19.0 | 40.6 | 4.4 | - | 22.5 | 7.8 | 48.9 | 39.2 | 7.8 | 57.1 | - | - | 74.9 | 23.6 | 28.9 |
| **N1- (n)** | **15** | **152** | **23** | **-** | **118** | **57** | **265** | **127** | **183** | **309** | **-** | **-** | **295** | **1,544** | **1,544** |
| **(%)** | **7.3** | **14.8** | **2.1** | **-** | **6.0** | **4.2** | **29.9** | **11.7** | **3.2** | **16.6** | **-** | **-** | **14.2** | **7.4** | **9.1** |
| N1 (%)[1] | 93.3 | 94.7 | 100.0 | - | 100.0 | 94.7 | 100.0 | 89.0 | 100.0 | 98.4 | - | - | 99.7 | 97.9 | |
| N1a (%)[1] | 6.7 | 5.3 | - | - | - | 5.3 | - | 11.0 | - | 1.3 | - | - | 0.3 | 2.0 | |
| N1c (%)[1] | - | - | - | - | - | - | - | - | - | 1.0 | - | - | - | 1.0 | |
| **N2- (n)** | **1** | **15** | **7** | **-** | **17** | **22** | **20** | **24** | **55** | **51** | **-** | **-** | **28** | **240** | **240** |
| **(%)** | **0.5** | **1.5** | **0.7** | **-** | **1.0** | **1.6** | **2.3** | **2.2** | **1.0** | **2.7** | **-** | **-** | **1.4** | **1.2** | **1.4** |
| N2 (%)[1] | 100.0 | 80.0 | 71.4 | - | 82.4 | 81.8 | 75.0 | 70.8 | 85.5 | 90.2 | - | - | 64.3 | 80.4 | |
| N2a (%)[1] | - | 6.7 | 28.6 | - | 11.8 | 18.2 | 25.0 | 20.8 | 14.5 | 9.8 | - | - | 35.7 | 17.5 | |
| N2b (%)[1] | - | 6.7 | - | - | 5.9 | - | - | 4.2 | - | - | - | - | - | 1.3 | |
| N2c (%)[1] | - | 6.7 | - | - | - | - | - | 4.2 | - | - | - | - | - | 0.8 | |
| **N3- (n)** | **3** | **12** | **5** | **-** | **19** | **12** | **26** | **12** | **55** | **55** | **-** | **-** | **13** | **212** | **212** |
| **(%)** | **1.5** | **1.2** | **0.5** | **-** | **1.1** | **0.9** | **2.9** | **1.1** | **1.0** | **2.9** | **-** | **-** | **0.6** | **1.0** | **1.2** |
| N3 (%)[1] | 33.3 | 66.7 | 40.0 | - | 52.6 | 58.3 | 34.6 | 75.0 | 67.3 | 50.9 | - | - | 46.2 | | |
| N3a (%)[1] | - | - | 20.0 | - | 15.8 | 16.7 | 26.9 | - | 5.5 | 20.0 | - | - | 7.7 | | |
| N3b (%)[1] | - | 8.3 | - | - | 10.5 | 8.3 | 11.5 | 8.3 | 12.7 | 18.2 | - | - | 30.8 | | |
| N3c (%)[1] | 66.7 | 25.0 | 40.0 | - | 21.1 | 16.7 | 26.9 | 16.7 | 14.5 | 10.9 | - | - | 15.4 | | |
| NX (n) | 1 | 402 | 32 | - | 1,165 | 68 | 52 | 494 | 197 | 33 | - | - | 177 | 2,621 | 2,621 |
| (%) | 0.5 | 39.3 | 3.0 | - | 68.5 | 5.1 | 5.9 | 45.5 | 3.4 | 1.8 | - | - | 8.6 | 12.6 | 15.4 |
| Unknown (n) | 146 | 27 | 959 | 305 | - | 1,075 | 89 | 4 | 4,802 | 353 | 2,840 | 670 | 6 | 11,276 | 7,461 |
| (%) | 71.2 | 2.6 | 89.4 | 100.0 | - | 80.3 | 10.1 | 0.4 | 83.7 | 18.9 | 100.0 | 100.0 | 0.3 | 54.2 | 43.9 |

(%) column percentage of total n

Pearson chi2(156) = 2.1e+04, p<0.0001

(%)[1] column percentage per n of cN-code (N1-N3)

EMH chi2(48) = 1.4e+04, p<0.00001 (collapsed to main categories)

[2] registration units with records only, i.e. units d, k and l excluded

## Table 42: Breast cancer: distribution of cM-codes (TNM) by registration unit (n=20,804)

| cM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| M0 (n) | 73 | 735 | 789 | - | 1,570 | 1,097 | 704 | 1,035 | 4,990 | 1,347 | - | - | 1,694 | 14,034 | 14,034 |
| (%) | 35.6 | 71.8 | 73.5 | - | 92.3 | 81.9 | 79.6 | 95.2 | 87.0 | 72.2 | - | - | 81.8 | 67.5 | 82.6 |
| M1 (n) | **11** | **83** | **45** | **-** | **115** | **55** | **76** | **34** | **289** | **157** | **-** | **-** | **95** | **960** | **960** |
| (%) | **5.4** | **8.1** | **4.2** | **-** | **6.8** | **4.1** | **8.6** | **3.1** | **5.0** | **8.4** | **-** | **-** | **4.6** | **4.6** | **5.7** |
| M1 (%)[1] | 100.0 | 97.6 | 100.0 | - | 100.0 | 100.0 | 98.7 | 100.0 | 99.7 | 100.0 | - | - | 100.0 | 99.6 | |
| M1b (%)[1] | - | - | - | - | - | - | 1.3 | - | 0.3 | - | - | - | - | 0.2 | |
| M1c (%)[1] | - | 2.4 | - | - | - | - | - | - | - | - | - | - | - | 0.2 | |
| MX (n) | 5 | 180 | 87 | - | 16 | 177 | 17 | 18 | 131 | 9 | - | - | 282 | 922 | 922 |
| (%) | 2.4 | 17.6 | 8.1 | - | 0.9 | 13.2 | 1.9 | 1.7 | 2.3 | 0.5 | - | - | 13.6 | 4.4 | 5.4 |
| Unknown (n) | 116 | 26 | 152 | 305 | - | 10 | 88 | - | 329 | 352 | 2,840 | 670 | - | 4,888 | 1,073 |
| (%) | 56.6 | 2.5 | 14.2 | 100.0 | - | 0.8 | 9.9 | - | 5.7 | 18.9 | 100.0 | 100.0 | - | 23.5 | 6.3 |

(%) column percentage of total n

Pearson chi2(60) = 1.7e+04, p<0.0001

(%)[1] column percentage per n of cM-code (M1)

EMH chi2(36) = 5.6e+03, p<0.00001 (collapsed to main categories)

[2] registration units with records only, i.e. units d, k and l excluded

Table 43: Breast cancer: distribution of pT-codes (TNM) by registration unit (n=20,804)

| pT-code | | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| T0 (n) | | - | 7 | 7 | - | 14 | 11 | 8 | 2 | 34 | 19 | - | - | 44 | 146 | 146 |
| (%) | | - | 0.7 | 0.7 | - | 0.8 | 0.8 | 0.9 | 0.2 | 0.6 | 1.0 | - | - | 2.1 | 0.7 | 0.9 |
| **T1- (n)** | | **96** | **410** | **569** | **-** | **813** | **635** | **376** | **443** | **2,359** | **565** | **-** | **-** | **1,029** | **7,295** | **7,295** |
| **(%)** | | **46.8** | **40.0** | **53.0** | **-** | **47.8** | **47.4** | **42.5** | **40.8** | **41.1** | **30.3** | **-** | **-** | **49.7** | **35.1** | **42.9** |
| | T1 (%)[1] | - | 0.7 | 2.6 | - | 2.3 | 0.2 | 0.0 | 3.2 | 0.2 | 0.5 | - | - | 1.4 | 1.0 | |
| | T1a (%)[1] | 6.3 | 6.6 | 6.0 | - | 6.0 | 6.5 | 3.7 | 5.4 | 6.4 | 4.1 | - | - | 7.1 | 6.1 | |
| | T1b (%)[1] | 18.8 | 22.0 | 25.7 | - | 24.2 | 22.0 | 26.3 | 21.4 | 20.7 | 21.1 | - | - | 28.6 | 23.1 | |
| | T1b1 (%)[1] | - | - | - | - | - | - | - | - | 0.1 | - | - | - | - | 0.1 | |
| | T1c (%)[1] | 69.8 | 69.8 | 63.6 | - | 66.7 | 68.8 | 67.0 | 70.0 | 71.4 | 72.7 | - | - | 61.9 | 68.4 | |
| | T1mic (%)[1] | 5.2 | 1.0 | 2.1 | - | 0.7 | 2.5 | 2.9 | - | 1.3 | 1.6 | - | - | 1.1 | 1.4 | |
| **T2- (n)** | | **62** | **280** | **276** | **-** | **414** | **383** | **267** | **386** | **1,825** | **529** | **-** | **-** | **457** | **4,879** | **4,879** |
| **(%)** | | **30.2** | **27.3** | **25.7** | **-** | **24.3** | **28.6** | **30.2** | **35.5** | **31.8** | **28.4** | **-** | **-** | **22.1** | **23.5** | **28.7** |
| | T2 (%)[1] | 100.0 | 99.6 | 99.3 | - | 99.5 | 100.0 | 99.6 | 99.7 | 99.9 | 100.0 | - | - | 100.0 | 99.8 | |
| | T2a (%)[1] | - | - | 0.4 | - | - | - | 0.4 | - | 0.1 | - | - | - | - | 0.1 | |
| | T2b (%)[1] | - | - | 0.4 | - | 0.2 | - | - | - | - | - | - | - | - | 0.1 | |
| | T2c (%)[1] | - | 0.4 | - | - | 0.2 | - | - | 0.3 | - | - | - | - | - | 0.1 | |
| **T3- (n)** | | **7** | **63** | **28** | **-** | **49** | **48** | **41** | **62** | **291** | **63** | **-** | **-** | **83** | **735** | **735** |
| **(%)** | | **3.4** | **6.2** | **2.6** | **-** | **2.9** | **3.6** | **4.6** | **5.7** | **5.1** | **3.4** | **-** | **-** | **4.0** | **3.5** | **4.3** |
| | T3 (%)[1] | 100.0 | 100.0 | 100.0 | - | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | - | - | 98.8 | 99.9 | |
| | T3b (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 1.2 | 0.1 | |
| **T4- (n)** | | **5** | **13** | **21** | **-** | **33** | **25** | **24** | **25** | **82** | **21** | **-** | **-** | **16** | **265** | **265** |
| **(%)** | | **2.4** | **1.3** | **2.0** | **-** | **1.9** | **1.9** | **2.7** | **2.3** | **1.4** | **1.1** | **-** | **-** | **0.8** | **1.3** | **1.6** |
| | T4 (%)[1] | - | 7.7 | 19.0 | - | 30.3 | 32.0 | - | 28.0 | 9.8 | - | - | - | 6.3 | 14.7 | |
| | T4a (%)[1] | - | 7.7 | 4.8 | - | 3.0 | - | - | - | 4.9 | 9.5 | - | - | 18.8 | 4.5 | |
| | T4b (%)[1] | 100.0 | 76.9 | 61.9 | - | 63.6 | 68.0 | 95.8 | 72.0 | 68.3 | 85.7 | - | - | 62.5 | 72.1 | |
| | T4c (%)[1] | - | 7.7 | - | - | - | - | - | - | 3.7 | - | - | - | - | 1.5 | |
| | T4d (%)[1] | - | - | 14.3 | - | 3.0 | - | 4.2 | - | 13.4 | 4.8 | - | - | 12.5 | 7.2 | |
| TX (n) | | - | 115 | 3 | - | 179 | 2 | 1 | 87 | 16 | 1 | - | - | 200 | 604 | 604 |
| (%) | | - | 11.2 | 0.3 | - | 10.5 | 0.2 | 0.1 | 8.0 | 0.3 | 0.1 | - | - | 9.7 | 2.9 | 3.6 |
| Ta (n) | | - | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| (%) | | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - | 0.0 | 0.0 |
| **Tis- (n)** | | **5** | **113** | **97** | **-** | **199** | **146** | **88** | **80** | **572** | **145** | **-** | **-** | **236** | **1,681** | **1,681** |
| **(%)** | | **2.4** | **11.0** | **9.0** | **-** | **11.7** | **10.9** | **9.9** | **7.4** | **10.0** | **7.8** | **-** | **-** | **11.4** | **8.1** | **9.9** |
| | Tis (%)[1] | 100.0 | 24.8 | 87.6 | - | 100.0 | 85.6 | 100.0 | 100.0 | 25.0 | 51.7 | - | - | 100.0 | 63.3 | |
| | Tis_DCIS (%)[1] | - | 69.0 | 12.4 | - | - | 13.7 | - | - | 68.0 | 42.8 | - | - | - | 52.7 | |
| | Tis_LCIS (%)[1] | - | 6.2 | - | - | - | 0.7 | - | - | 7.0 | 4.8 | - | - | - | 9.8 | |
| | Tis_Paget (%)[1] | - | - | - | - | - | - | - | - | - | 0.7 | - | - | - | 1.8 | |
| Unknown (n) | | 30 | 22 | 72 | 305 | - | 89 | 80 | 2 | 560 | 522 | 2,840 | 670 | 6 | 5,198 | 1,383 |
| (%) | | 14.6 | 2.2 | 6.7 | 100.0 | - | 6.7 | 9.0 | 0.2 | 9.8 | 28.0 | 100.0 | 100.0 | 0.3 | 25.0 | 8.1 |

(%) column percentage of total n

(%)[1] column percentage per n of pT-code (T1-T4, Tis)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(288) = 1.8e+04, p<0.0001

EMH chi2(84) = 5.3e+03, p<0.00001 (collapsed to main categories)

Table 44: Breast cancer: distribution of pN-codes (TNM) by registration unit (n=20,804)

| pN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| N0 (n) | 106 | 483 | 603 | - | 727 | 724 | 393 | 582 | 2,722 | 683 | - | - | 1,149 | 8,172 | 8,172 |
| (%) | 51.7 | 47.2 | 56.2 | - | 42.7 | 54.1 | 44.4 | 53.5 | 47.4 | 36.6 | - | - | 55.5 | 39.3 | 48.1 |
| **N1- (n)** | **50** | **216** | **217** | **-** | **358** | **286** | **192** | **267** | **1,299** | **373** | **-** | **-** | **376** | **3,634** | **3,634** |
| **(%)** | **24.4** | **21.1** | **20.2** | **-** | **21.0** | **21.4** | **21.7** | **24.6** | **22.6** | **20.0** | **-** | **-** | **18.2** | **17.5** | **21.4** |
| N1 (%)[1] | 6.0 | 9.7 | 24.4 | - | 49.2 | 5.9 | 3.1 | 40.4 | 29.8 | 33.0 | - | - | 9.0 | 25.5 | |
| N1a (%)[1] | 70.0 | 62.5 | 55.8 | - | 47.5 | 64.3 | 68.8 | 58.8 | 48.9 | 49.3 | - | - | 68.9 | 55.4 | |
| N1b (%)[1] | - | - | - | - | - | 1.0 | 0.5 | - | 0.2 | - | - | - | 0.3 | 0.2 | |
| N1c (%)[1] | - | 0.5 | 0.9 | - | 1.7 | 1.0 | - | 0.7 | 0.8 | 2.7 | - | - | 0.8 | 1.0 | |
| N1mi (%)[1] | 24.0 | 27.3 | 18.9 | - | 1.7 | 27.6 | 27.6 | - | 20.3 | 15.0 | - | - | 21.0 | 17.9 | |
| **N2- (n)** | **10** | **62** | **65** | **-** | **93** | **91** | **64** | **73** | **389** | **105** | **-** | **-** | **90** | **1,042** | **1,042** |
| **(%)** | **4.9** | **6.1** | **6.1** | **-** | **5.5** | **6.8** | **7.2** | **6.7** | **6.8** | **5.6** | **-** | **-** | **4.3** | **5.0** | **6.1** |
| N2 (%)[1] | 10.0 | 9.7 | 18.5 | - | 30.1 | 5.5 | 1.6 | 13.7 | 23.4 | 19.0 | - | - | 8.9 | 17.5 | |
| N2a (%)[1] | 90.0 | 88.7 | 81.5 | - | 69.9 | 93.4 | 98.4 | 84.9 | 75.8 | 81.0 | - | - | 88.9 | 81.8 | |
| N2b (%)[1] | - | 0.1 | - | - | - | 1.1 | - | 1.4 | 0.5 | - | - | - | 2.2 | 0.7 | |
| N2mi (%)[1] | - | - | - | - | - | - | - | - | 0.3 | - | - | - | - | 0.1 | |
| **N3- (n)** | **9** | **53** | **33** | **-** | **54** | **35** | **43** | **43** | **230** | **45** | **-** | **-** | **57** | **602** | **602** |
| **(%)** | **4.4** | **5.2** | **3.1** | **-** | **3.2** | **2.6** | **4.9** | **4.0** | **4.0** | **2.4** | **-** | **-** | **2.8** | **2.9** | **3.5** |
| N3 (%)[1] | - | 7.5 | 45.5 | - | 25.9 | - | 2.3 | 14.0 | 26.1 | 15.6 | - | - | 10.5 | 18.8 | |
| N3a (%)[1] | 77.8 | 83.0 | 54.5 | - | 74.1 | 97.1 | 93.0 | 83.7 | 68.7 | 77.8 | - | - | 78.9 | 75.9 | |
| N3b (%)[1] | - | 5.7 | - | - | - | 2.9 | 2.3 | 2.3 | 1.7 | 6.7 | - | - | 8.8 | 3.0 | |
| N3c (%)[1] | 22.2 | 3.8 | - | - | - | - | 2.3 | - | 3.5 | - | - | - | 1.8 | 2.3 | |
| NX (n) | - | 189 | 40 | - | 469 | 8 | - | 120 | 22 | 1 | - | - | 393 | 1,242 | 1,242 |
| (%) | - | 18.5 | 3.7 | - | 27.6 | 0.6 | - | 11.0 | 0.4 | 0.1 | - | - | 19.0 | 6.0 | 7.3 |
| Unknown (n) | 30 | 21 | 115 | 305 | - | 195 | 193 | 2 | 1,077 | 658 | 2,840 | 670 | 6 | 6,112 | 2,297 |
| (%) | 14.6 | 2.1 | 10.7 | 100.0 | - | 14.6 | 21.8 | 0.2 | 18.8 | 35.3 | 100.0 | 100.0 | 0.3 | 29.4 | 13.5 |

(%) column percentage of total n

(%)[1] column percentage per n of pN-code (N1-N3)

[2] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(180) = 1.6e+04 , p<0.0001

EMH chi2(60) = 6.0e+03, p<0.00001 (collapsed to main categories)

Table 45: Breast cancer: distribution of pM-codes (TNM) by registration unit (n=20,804)

| pM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 | 16,989 |
| M0 (n) | 166 | 21 | 8 | - | 9 | - | - | 125 | 4 | 3 | - | - | 6 | 342 | 342 |
| (%) | 81.0 | 2.1 | 0.8 | - | 0.5 | - | - | 11.5 | 0.1 | 0.2 | - | - | 0.3 | 1.6 | 2.0 |
| M1 (n) | 5 | 10 | 9 | - | 28 | 1 | 23 | 18 | 25 | 11 | - | - | 20 | 150 | 150 |
| (%) | 2.4 | 1.0 | 0.8 | - | 1.7 | 0.1 | 2.6 | 1.7 | 0.4 | 0.6 | - | - | 1.0 | 0.7 | 0.9 |
| M1b (n) | - | - | - | - | - | - | 1 | - | - | - | - | - | - | 1 | 1 |
| (%) | - | - | - | - | - | - | 0.1 | - | - | - | - | - | - | 0.0 | 0.0 |
| MX (n) | 2 | 968 | 291 | - | 1,664 | - | - | 944 | 1 | - | - | - | 2,045 | 5,915 | 5,915 |
| (%) | 1.0 | 94.5 | 27.1 | - | 97.8 | - | - | 86.8 | 0.0 | - | - | - | 98.7 | 28.4 | 34.8 |
| Unknown (n) | 32 | 25 | 765 | 305 | - | 1,338 | 861 | - | 5,709 | 1,851 | 2,840 | 670 | - | 14,396 | 10,581 |
| (%) | 15.6 | 2.4 | 71.3 | 100.0 | - | 99.9 | 97.3 | - | 99.5 | 99.3 | 100.0 | 100.0 | - | 69.2 | 62.3 |

(%) column percentage

[1] registration units with records only, i.e. units d, k and l excluded

Pearson chi2(60) = 1.7e+04, p<0.0001

EMH chi2(60) = 1.3e+04, p<0.00001

### 3.3.3 Date of diagnosis and treatment data

The distribution of date of breast cancer diagnosis differed moderately between the registries (table 46). The second and fourth quarter of the year were the most frequently recorded (26% both), followed by the first (25%), and the third quarter (23%). The observed seasonal variation was statistically significant (p=0.023), although not anymore when controlling for sex, age, year of diagnosis ***and screening*** (p=0.1572). Assignments of the months December, February and August as the date of first event varied the most between registries (6-13%, 7-12%, 3-8%, respectively). The observed differences were statistically significant (p=0.018), although not anymore when controlling for the covariates (p=0.0885). Stratified cross-tabulations for each covariate revealed that not adjusting for screening led to statistically significant results (quarters: p=0.0235, months: p=0.0087).

Table 46: Breast cancer: distribution of date of diagnosis by registration unit (n=20,804)

| Date of diagnosis | Registration unit | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | overall |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| ***1st quarter (%)*** | ***29.3*** | ***23.4*** | ***24.6*** | ***20.0*** | ***27.3*** | ***27.7*** | ***24.9*** | ***23.2*** | ***25.5*** | ***22.6*** | ***24.7*** | ***24.8*** | ***26.3*** | ***25.1*** |
| January (%) | 9.3 | 8.5 | 7.8 | 5.9 | 8.9 | 9.0 | 9.2 | 7.1 | 8.9 | 7.4 | 8.1 | 6.4 | 8.3 | 8.3 |
| February (%) | 11.7 | 6.7 | 7.1 | 7.5 | 7.8 | 9.8 | 8.8 | 7.7 | 7.8 | 8.1 | 8.0 | 8.5 | 8.7 | 8.1 |
| March (%) | 8.3 | 8.2 | 9.7 | 6.6 | 10.6 | 8.9 | 6.9 | 8.4 | 8.8 | 7.1 | 8.6 | 9.9 | 9.3 | 8.7 |
| ***2nd quarter (%)*** | ***26.8*** | ***26.9*** | ***25.6*** | ***24.3*** | ***24.6*** | ***24.6*** | ***24.9*** | ***27.1*** | ***25.5*** | ***27.1*** | ***25.5*** | ***27.8*** | ***24.0*** | ***25.6*** |
| April (%) | 10.7 | 10.0 | 7.9 | 7.2 | 6.8 | 7.2 | 8.3 | 8.8 | 8.4 | 8.3 | 7.7 | 8.1 | 7.2 | 8.0 |
| Mai (%) | 9.3 | 6.9 | 9.0 | 7.9 | 9.3 | 8.4 | 7.7 | 9.3 | 8.8 | 9.5 | 8.6 | 9.7 | 7.8 | 8.7 |
| June (%) | 6.8 | 10.0 | 8.8 | 9.2 | 8.5 | 8.9 | 8.9 | 8.9 | 8.4 | 9.3 | 9.2 | 10.0 | 9.0 | 8.9 |
| ***3rd quarter (%)*** | ***18.1*** | ***26.1*** | ***22.3*** | ***23.0*** | ***23.3*** | ***21.1*** | ***24.8*** | ***25.0*** | ***22.7*** | ***23.3*** | ***22.6*** | ***21.0*** | ***22.6*** | ***22.9*** |
| July (%) | 9.3 | 8.8 | 8.8 | 8.2 | 10.1 | 7.1 | 8.7 | 9.8 | 8.4 | 8.0 | 7.4 | 9.0 | 8.1 | 8.4 |
| August (%) | 2.9 | 7.7 | 5.8 | 6.2 | 5.8 | 6.2 | 7.5 | 7.4 | 6.7 | 6.8 | 6.4 | 5.2 | 6.4 | 6.5 |
| September (%) | 5.9 | 9.6 | 7.7 | 8.5 | 7.4 | 7.8 | 8.6 | 7.9 | 7.7 | 8.5 | 8.8 | 6.9 | 8.2 | 8.1 |
| ***4th quarter (%)*** | ***25.9*** | ***23.6*** | ***27.5*** | ***32.8*** | ***24.9*** | ***26.7*** | ***25.5*** | ***24.8*** | ***26.3*** | ***27.0*** | ***27.2*** | ***26.4*** | ***27.2*** | ***26.4*** |
| October (%) | 10.2 | 8.7 | 9.9 | 9.5 | 8.5 | 8.5 | 8.5 | 8.0 | 8.9 | 8.0 | 9.1 | 7.6 | 8.9 | 8.7 |
| November (%) | 9.8 | 8.5 | 7.9 | 10.5 | 8.0 | 9.6 | 11.1 | 9.0 | 8.9 | 9.8 | 9.5 | 10.9 | 10.6 | 9.3 |
| December (%) | 5.9 | 6.5 | 9.7 | 12.8 | 8.4 | 8.6 | 6.0 | 7.7 | 8.5 | 9.2 | 8.6 | 7.9 | 7.7 | 8.3 |

(%) column percentage

| | | |
|---|---|---|
| Quarters: | Pearson chi2(36) = 54.89, p=0.023 | EMH chi2(36) = 44.47, p=0.1572 |
| Months: | Pearson chi2(132) = 168.44, p=0.018 | EMH chi2(132) = 154.44, p=0.0885 |

Information on patient treatment represented level 2 data, which meant that the registries could, at their discretion, transmit such information to NICER. **Units a, d, h, k and l** did not provide any treatment data. (Units d, k and l did not also provide information on mode of detection, histological grade and TNM stage; additionally unit h on mode of detection). Treatment data were provided by eight registration units (registries b, c, e, f, g, i, j and m) and for 52% of all breast cancer diagnoses (table 47). The average treatment number per diagnosis ranged from 0.5 to 3.4 between the registries, with 1.3 treatments overall. Six units had treatment information for almost all of their diagnoses (94-99%) and **units i and j** for 25% and 78%, respectively (p<0.0001). Among all registries with treatment data, information was limited to the first treatment in 18% of all cases, to two treatments in 8%, to three treatments in 13%, to four treatments in 8% and to five treatments in 5%. Apart from **unit m,** which had information only on the first treatment, the remaining registries had information up to the fifth treatment of a patient. These results remained statistically significant when controlling for sex, age and year of diagnosis (p<0.00001).

Table 47: Breast cancer: distribution of treatment data by registration unit (n=20,804)

| Treatment | Registation unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 205 | 1,024 | 1,073 | 305 | 1,701 | 1,339 | 885 | 1,087 | 5,739 | 1,865 | 2,840 | 670 | 2,071 | 20,804 |
| No treatment data (n) | 205 | 63 | 11 | 305 | 78 | 35 | 29 | 1,087 | 4,287 | 416 | 2,840 | 670 | 65 | 10,091 |
| (%) | 100.0 | 6.2 | 1.0 | 100.0 | 4.6 | 2.6 | 3.3 | 100.0 | 74.7 | 22.3 | 100.0 | 100.0 | 3.1 | 48.5 |
| Treatment data (n) | - | 961 | 1,062 | - | 1,623 | 1,304 | 856 | - | 1,452 | 1,449 | - | - | 2,006 | 10,713 |
| (%) | - | 93.9 | 99.0 | - | 95.4 | 97.4 | 96.7 | - | 25.3 | 77.7 | - | - | 96.9 | 51.5 |
| Average treatment number per case | - | 2.6 | 2.9 | - | 3.4 | 2.9 | 2.8 | - | 0.5 | 2.1 | - | - | 1.0 | 1.3 |
| ***1st treatment (n)*** | ***-*** | ***190*** | ***112*** | ***-*** | ***162*** | ***112*** | ***120*** | ***-*** | ***693*** | ***294*** | ***-*** | ***-*** | ***2,006*** | ***3,689*** |
| ***(%)*** | ***-*** | ***18.6*** | ***10.4*** | ***-*** | ***9.5*** | ***8.4*** | ***13.6*** | ***-*** | ***12.1*** | ***15.8*** | ***-*** | ***-*** | ***96.9*** | ***17.7*** |
| ***2nd treatment (n)*** | ***-*** | ***218*** | ***182*** | ***-*** | ***240*** | ***265*** | ***168*** | ***-*** | ***397*** | ***258*** | ***-*** | ***-*** | ***-*** | ***1,728*** |
| ***(%)*** | ***-*** | ***21.3*** | ***17.0*** | ***-*** | ***14.1*** | ***19.8*** | ***19.0*** | ***-*** | ***6.9*** | ***13.8*** | ***-*** | ***-*** | ***-*** | ***8.3*** |
| ***3rd treatment (n)*** | ***-*** | ***289*** | ***453*** | ***-*** | ***273*** | ***511*** | ***314*** | ***-*** | ***266*** | ***535*** | ***-*** | ***-*** | ***-*** | ***2,641*** |
| ***(%)*** | ***-*** | ***28.2*** | ***42.2*** | ***-*** | ***16.1*** | ***38.2*** | ***35.5*** | ***-*** | ***4.6*** | ***28.7*** | ***-*** | ***-*** | ***-*** | ***12.7*** |
| ***4th treatment (n)*** | ***-*** | ***165*** | ***246*** | ***-*** | ***415*** | ***306*** | ***164*** | ***-*** | ***80*** | ***274*** | ***-*** | ***-*** | ***-*** | ***1,650*** |
| ***(%)*** | ***-*** | ***16.1*** | ***22.9*** | ***-*** | ***24.4*** | ***22.9*** | ***18.5*** | ***-*** | ***1.4*** | ***14.7*** | ***-*** | ***-*** | ***-*** | ***7.9*** |
| ***5th treatment (n)*** | ***-*** | ***99*** | ***69*** | ***-*** | ***533*** | ***110*** | ***90*** | ***-*** | ***16*** | ***88*** | ***-*** | ***-*** | ***-*** | ***1,005*** |
| ***(%)*** | ***-*** | ***9.7*** | ***6.4*** | ***-*** | ***31.3*** | ***8.2*** | ***10.2*** | ***-*** | ***0.3*** | ***4.7*** | ***-*** | ***-*** | ***-*** | ***4.8*** |

(%) column percentage Pearson chi2(60) = 2.6e+04 , p<0.0001 EMH chi2(60) = 2.3e+04, p<0.00001

## 3.4 Prostate cancer – outcome variables

### 3.4.1 Topography, morphology, mode of detection and basis of diagnosis

Prostate cancer diagnoses (n=19,836, 100% males) are in general assigned C61.9, the ICD-O-3 ***topography code*** for prostate gland. There were no differing topographical codes to be analysed by sex, year of diagnosis and registration unit. Patients with prostate cancer were mainly 65-74 years old (41%), with lower proportions in the 55-64 and 75-84 age groups (23% both; table 8).

Non-specific coding of ***morphology***, denoted as 'other, unspecified', was more common among older (32% in the age group 85+) than among younger patients (1-7% in patients younger up to age 84). In contrast, the proportion of adenomas and adenocarcinomas decreased from 99% (age <55) to 67% (age 85+). These findings suggest that the very elderly were rather non-specifically coded. The remaining morphological codes did not substantially differ between the age groups (p<0.0001). All codes varied less than 1% with increasing year of diagnosis (p<0.0001). However, the proportion of non-specific coding of morphology declined from 5.2% to 4.6% during 2008-12. The registration units (table 48) assigned most frequently the category 'adenomas and adenocarcinomas' (94%), in a rather narrow range (89-97%). The proportions of non-specific morphology coding accounted only for 5% of all cases and ranged widely from 0.2% in **unit h** to 10% **in unit b** (p<0.0001). The overall proportion of acinic cell carcinoma was extremely low (<1%). However, **unit h** assigned 7% of its cases accordingly. These results remained statistically significant when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.00001). The detection method of adenomas and adenocarcinomas, acinic cell carcinomas and unspecified neoplasms was primarily unknown (58-86%). These tumours were second most frequently detected by screening methods (10-32%) and third most frequently by incidental findings (3-6%; $\chi^2(20) = 438.58$; p<0.0001).

The ***method of first detection of tumour*** represented level 2 information. To provide NICER with such information was not mandatory during the time period under study. **Units d, e, h, k and l** did not provide information on the detection method. Therefore, their prostate cancer diagnoses were excluded from the

analyses of the distribution of codes ***by registration unit***. The proportion of screen-detected prostate cancers decreased from 39% (age <55) to 13% (age 85+). The proportions of the remaining categories increased mainly in the age group 85+ (p<0.0001). Prostate cancers diagnosed following symptoms detected by the patient rose from 5% (age 75-84) to 11% (age 85+). The proportion of diagnoses with unknown mode of detection rose from 54% (age <55) to 62% (age 85+). The proportion of screen-detected prostate cancers almost tripled to 48% in 2012 (p<0.0001). The proportion of diagnoses with unknown mode of detection fell strongly from 76% to 34% during 2008-12. This pattern indicates a more precise coding of the detection method during the observation period, which is supported by a more frequent recording of tumour symptoms and incidental findings. Screening methods were recorded the most frequently (44%; table 49) and ranged extremely between the registries (6-80%; p<0.0001). The proportion of non-specific detection method coding was the second highest (41%) and ranged from 2% in **unit c** to 88% in **unit b**. The range of the frequencies of the categories tumour symptoms and incidental finding was moderately (1-9% and 3-19%, respectively. The proportions of the codes remained statistically significantly different when controlling for sex, age and year of diagnosis (p<0.00001).

Histology of primarily tumour as ***basis of diagnosis*** was coded in 94% of all prostate cancer diagnoses (table 50). Records of 'histology of primary tumour' fell steadily with increasing age of patients, from 99% (age <55) to 63% (age 85+). By comparison, proportions of all remaining categories rose in the highest age group (p<0.0001). The proportions of tumour markers and DCO increased the most, from 3% (age 75-84) to 14% (age 85+) and from 1% (age 75-84) to 7% (age 85+), respectively. All basis of diagnosis codes did not differ substantially by year of diagnosis (p<0.0001). All cancer registries had well differentiated records of the microscopic proportion, since it represents an international quality criterion. Therefore, the proportion of non-specific coding of basis of diagnosis was extremely low (0.2%). These results remained statistically significant when controlling for sex, age, and year of diagnosis (p<0.00001).

Table 48: Prostate cancer: distribution of ICD-O-3 morphology codes by registration unit (n=19,836)

| Morphology code | | Registration unit | | | | | | | | | | | | | overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 |
| Adenomas / adenocarcinomas (n) | | 215 | 846 | 1,143 | 274 | 1,165 | 1,357 | 1,274 | 975 | 4,982 | 2,057 | 2,438 | 527 | 1,445 | 18,698 |
| | (%) | 96.4 | 89.4 | 97.4 | 93.8 | 95.9 | 90.7 | 94.9 | 92.9 | 94.4 | 95.1 | 95.5 | 91.7 | 94.5 | 94.3 |
| Cystic, mucinous and serous (n) | | 1 | 1 | 1 | - | - | 7 | - | - | 1 | 11 | 6 | 1 | 2 | 31 |
| neoplasms | (%) | 0.5 | 0.1 | 0.1 | - | - | 0.5 | - | - | 0.0 | 0.5 | 0.2 | 0.2 | 0.1 | 0.2 |
| Ductal, lobular and medullary (n) | | - | 2 | 1 | - | - | - | - | - | 5 | 6 | 14 | - | 1 | 29 |
| neoplasms | (%) | - | 0.2 | 0.1 | - | - | - | - | - | 0.1 | 0.3 | 0.6 | - | 0.1 | 0.2 |
| Acinic cell carcinoma (n) | | - | - | 7 | - | - | 7 | - | 71 | 15 | - | 4 | - | - | 104 |
| | (%) | - | - | 0.6 | - | - | 0.5 | - | 6.8 | 0.3 | - | 0.2 | - | - | 0.5 |
| Other, specified (n) | | - | - | 2 | 1 | 1 | - | - | 2 | 6 | 5 | 3 | - | 1 | 21 |
| | (%) | - | - | 0.2 | 0.3 | 0.1 | - | - | 0.2 | 0.1 | 0.2 | 0.1 | - | 0.1 | 0.1 |
| Other, unspecified (n) | | 7 | 97 | 20 | 17 | 49 | 125 | 69 | 2 | 269 | 84 | 87 | 47 | 80 | 953 |
| | (%) | 3.1 | 10.3 | 1.7 | 5.8 | 4.0 | 8.4 | 5.1 | 0.2 | 5.1 | 3.9 | 3.4 | 8.2 | 5.2 | 4.8 |

(%) column percentage

Pearson chi2(60) = 1.1e+03, p<0.0001 EMH chi2(60) = 768.17, p<0.00001

Table 49: Prostate cancer: Method of 1st detection of tumour by registration unit (n=19,836)

| Detection | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 14,152 |
| Symptoms (n) | 2 | 33 | 106 | - | - | 65 | 49 | - | 181 | 117 | - | - | 110 | 663 | 663 |
| (%) | 0.9 | 3.5 | 9.0 | - | - | 4.3 | 3.7 | - | 3.4 | 5.4 | - | - | 7.2 | 3.3 | 4.7 |
| Incidental (n) | 20 | 25 | 99 | - | - | 290 | 69 | - | 239 | 190 | - | - | 187 | 1,119 | 1,119 |
| (%) | 9.0 | 2.6 | 8.4 | - | - | 19.4 | 5.1 | - | 4.5 | 8.8 | - | - | 12.2 | 5.6 | 7.9 |
| Screening (n) | 179 | 56 | 944 | - | - | 1,067 | 305 | - | 2,136 | 470 | - | - | 1,028 | 6,185 | 6,185 |
| (%) | 80.3 | 5.9 | 80.4 | - | - | 71.3 | 22.7 | - | 40.5 | 21.7 | - | - | 67.2 | 31.2 | 43.7 |
| Other (n) | 7 | 4 | 1 | - | - | - | - | - | 339 | - | - | - | 17 | 368 | 368 |
| (%) | 3.14 | 0.42 | 0.09 | - | - | - | - | - | 6.42 | - | - | - | 1.11 | 1.86 | 2.6 |
| Unknown (n) | 15 | 828 | 24 | 292 | 1,215 | 74 | 920 | 1,050 | 2,383 | 1,386 | 2,552 | 575 | 187 | 11,501 | 5,817 |
| (%) | 6.7 | 87.5 | 2.0 | 100.0 | 100.0 | 5.0 | 68.5 | 100.0 | 45.2 | 64.1 | 100.0 | 100.0 | 12.2 | 58.0 | 41.1 |

(%) column percentage Pearson chi2(48) = 1.1e+04 , p<0.0001 EMH chi2(48) = 1.2e+04, p<0.00001

[1] registration units with records only, i.e. units d, e, h, k and l excluded

Table 50: Prostate cancer: distribution of basis of diagnosis codes by registration unit (n=19,836)

| **Basis of diagnosis** | **Registration unit** | | | | | | | | | | | | | **Overall** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 |
| DCO (n) | 3 | 19 | - | 3 | 10 | 6 | 1 | - | 91 | 2 | 31 | 2 | 13 | 181 |
| (%) | 1.4 | 2.0 | - | 1.0 | 0.8 | 0.4 | 0.1 | - | 1.7 | 0.1 | 1.2 | 0.4 | 0.9 | 0.9 |
| Clinical (n) | 1 | 4 | 3 | 14 | 2 | 3 | 4 | - | 29 | 7 | 43 | 42 | 5 | 157 |
| (%) | 0.5 | 0.4 | 0.3 | 4.8 | 0.2 | 0.2 | 0.3 | - | 0.6 | 0.3 | 1.7 | 7.3 | 0.3 | 0.8 |
| Clinical investigation (n) | - | 6 | 9 | - | 29 | 9 | 44 | 8 | 11 | 10 | - | - | 10 | 136 |
| (%) | - | 0.6 | 0.8 | - | 2.4 | 0.6 | 3.3 | 0.8 | 0.2 | 0.5 | - | - | 0.7 | 0.7 |
| Tumour markers (n) | 2 | 45 | 7 | - | 54 | 58 | 9 | - | 134 | 49 | - | - | 55 | 413 |
| (%) | 0.9 | 4.8 | 0.6 | - | 4.4 | 3.9 | 0.7 | - | 2.5 | 2.3 | - | - | 3.6 | 2.1 |
| Cytology (n) | - | 4 | 2 | - | 1 | 1 | 8 | 1 | 4 | 69 | 4 | 3 | 3 | 100 |
| (%) | - | 0.4 | 0.2 | - | 0.1 | 0.1 | 0.6 | 0.1 | 0.1 | 3.2 | 0.2 | 0.5 | 0.2 | 0.5 |
| Histology of metastasis (n) | 2 | 9 | 4 | 1 | 10 | 10 | 3 | 4 | 27 | 15 | 20 | 1 | - | 106 |
| (%) | 0.9 | 1.0 | 0.3 | 0.3 | 0.8 | 0.7 | 0.2 | 0.4 | 0.5 | 0.7 | 0.8 | 0.2 | - | 0.5 |
| Histology of primary tumour (n) | 215 | 840 | 1,149 | 274 | 1,107 | 1,409 | 1,269 | 1,037 | 4,980 | 2,004 | 2,447 | 527 | 1,442 | 18,700 |
| (%) | 96.4 | 88.8 | 97.9 | 93.8 | 91.1 | 94.2 | 94.5 | 98.8 | 94.4 | 92.7 | 95.9 | 91.7 | 94.3 | 94.3 |
| Unknown (n) | - | 19 | - | - | 2 | - | 5 | - | 2 | 7 | 7 | - | 1 | 43 |
| (%) | - | 2.0 | - | - | 0.2 | - | 0.4 | - | 0.0 | 0.3 | 0.3 | - | 0.1 | 0.2 |

(%) column percentage

Pearson chi2(84) = 1.6e+03, p<0.0001 EMH chi2 (84) = 1.4e+03, p<0.00001

### 3.4.2 Grade and TNM staging

Histological grade and TNM staging information corresponded to level 2 data. The cancer registries were not required to provide NICER with such information. Due to missing classification information, prostate cancer diagnoses of the **units d, e, k and l** fell into the category 'unknown' and were excluded from the analyses of the distribution of codes ***by registration unit.***

Non-specific coding of ***histological grade*** of prostate cancer rose with increasing age of patients (from 27% in the age group <55 to 48% in the age group 85+) and confirms an age gradient, which was already observed with the outcome variable morphology (p<0.0001). The proportion of prostate cancer assigned grade X (undetermined grade) was the highest among patients aged 85+ years (4%) and the lowest among patients younger up to age 84 (0.1-1.2%). As a consequence, the proportions of grade 2 decreased from 39% (age <55) to 13% (age 85+) and that of grade 3/4 from 41% (age 75-84) to 35% (age 85+). The proportions of grade 1 did not substantially differ between the age groups. The proportion of grade 3/4 rose steadily from 31% to 47% during 2008-12 (p<0.0001). In contrast, the proportion of grade 2 declined steadily from 37% to 24% during 2008-12. The proportion of non-specific coding of histological grade also declined from 31% to 27% during 2011-12. Of all codes, grade 3/4 was the most frequently recorded (52%) and grade 2 the second most frequently (38%; table 51; p<0.0001). The corresponding proportions varied widely between the registries (19-67% and 16-87%, respectively). Non-specific coding of histological grade ranged from 1% in **unit h** to 36% in **unit b** and was the third most frequently assigned code (8%). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.00001). Prostate cancer assignments of grade 1, grade 2, grade X or unknown grade were the most frequent if the detection method was unknown (50-91%) and second most frequent in the case of general screening methods (16-35%). Prostate cancer diagnoses assigned grade 3/4 were mainly detected by general screening methods (49%), followed by unknown mode of detection (39%; $\chi^2(16) = 4.6e+03$; p<0.0001).

Of the ***cTNM codes*** for prostate cancer, codes cTX, cNX and cMX became the most frequently recorded with increasing age of patients, with proportions of 16% (+12%), 25% (+18%) and 13% (+5%), respectively, in the age group 85+ (p<0.0001). In contrast, non-specific coding of the cT category decreased from 61% to 54% (age 85+) and that of the cN category from 60% (age 55-64) to 53% (age 85+). However, non-specific coding of the cM category increased from 40% (age <55) to 52% (age 85+). While the codes cT1, cN0 and cM0 were less frequently recorded with age, the coding of the remaining cTNM codes increased with age of the patients (p<0.0001). Non-specific coding of the clinical TNM declined strongly during 2009-12 (p <0.0001). The assignments of cTX, cNX and cMX also declined during 2009-12, but only slightly. In contrast, the remaining cTNM categories were more frequently coded during the years in question. These results suggest an improvement in coding of cTNM until 2012. Non-specific coding of all clinical TNM categories for prostate cancer was the highest if the detection method was unknown (76-90%) and second highest in the case of screening methods (7-19%). Codes cT0 and cT1-T3 were the most frequently applied if the prostate cancer was detected by screening methods (43-62%) and code cT4 following detection by tumour symptoms (38%). However, the proportion of code cT4 was the second highest in the case of screening methods (34%; $\chi^2(24) = 6.1e+03$; p<0.0001). Codes cN0 and cN1-N3 were also primarily assigned if the tumour was detected by screening methods (42-68%; $\chi^2(20) = 5.9e+03$; p<0.0001). Assignments of the code cM0 and cMX were the highest if the tumour was detected

by screening methods (52% and 51%, respectively) and that of code cM1 if the tumour was detected by symptoms (34%; $\chi^2(24) = 9.5e+03$; $p<0.0001$).

Of the ***pTNM codes*** for prostate cancer, non-specific coding of the entire pTNM became the most frequent assignment with increasing age of patients, with proportions of 83% (+30%), 86% (+27%) and 85% (+4%), respectively, in the age group 85+ ($p<0.0001$). Assignments of the code pTX also increased from 5% (age <55) to 11% (age 85+) and that of pNX from 8% (age <55) to 13% (age 75-84). In contrast, the proportions of the codes pT2, pT3, pN0 and pMX decreased with age and were the lowest in the age group 85+ (by 30% to 2%, by 9% to 1%, by 28% to 2% and by 6% to 12%, respectively). Non-specific coding of the pathological TNM declined only slightly during 2008-12 and in the case of the pM category even rose slightly during 2010-12. However, the proportions of pTX, pNX and pMX declined strongly during 2010-12. In contrast, the remaining pTNM categories were more frequently coded during the years in question. These results suggest a partial improvement in coding of pTNM until 2012. Non-specific coding of all pathological TNM categories for prostate cancer was the highest if the detection method was unknown (61-70%) and second highest in the case of screening methods (20-29%). Codes pT2 and pT3 were the most frequently applied if the prostate cancer was detected by screening methods (61% and 64%, respectively) and code pT1 following incidental findings (37%). However, the proportion of code pT1 was the second highest in the case of screening methods (23%; $\chi^2(24) = 4.3e+03$; $p<0.0001$). Codes pN0 and pN1 were also primarily assigned if the tumour was detected by screening methods (62% and 54%; $\chi^2(12) = 2.8e+03$; $p<0.0001$). Assignments of the code pM0 were the highest if the tumour was detected by screening methods (46%) and that of code pM1 if the tumour was detected by symptoms (41%; $\chi^2(24) = 1.7e+03$; $p<0.0001$).

Tables 52-54 present the distribution of ***the cTNM codes for prostate cancer by registration unit***. Less than 1% of all prostate cancer diagnoses were not coded according to the clinical TNM classification, as some registries also assigned the codes 'T1b2', 'T3c', 'N2' and 'N3'. **Unit f** used incorrect cTNM codes the most. Only **units a and g** listed correct codes for the entire cTNM. Only registration **unit g** coded according to the 7th edition of the UICC TNM classification of malignant tumours and therefore avoided to assign cMX. The remaining registries coded according to the 6th edition of the UICC TNM classification of malignant tumours and therefore assigned code cMX (11% overall). Registries providing information on the cT and cN categories most frequently coded non-specifically (46% and 42%, respectively; $p<0.0001$). The range of the corresponding frequencies in the registries was extremely wide (85% and 86%, respectively). The proportions of non-specific assignments were extremely low in **unit m,** and **unit h** had even no such assignment. These units had higher proportions of the codes cTX, cNX and cMX. The proportions of non-specific assignments were the highest in **unit b**. Of the cM category codes, cM0 was the most frequently used code (57%; $p<0.0001$). The corresponding proportions ranged widely between the registries (7-93%). The codes cT1, cN0 and unknown cM were the second most frequently recorded of the entire cTNM (39%, 26% and 27%, respectively) and codes cT2, cNX and cMX the third most frequently (13%, 15% and 11%, respectively). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.00001$).

Tables 55-57 present the distribution of the ***p*TNM *codes for prostate cancer by cancer registries***. Less than 3% of all prostate cancer diagnoses were not coded according to the pathological TNM classification, as some registries also assigned the codes pT3c', 'pTa', 'pTis', 'N1a' and 'N1mi'. **Unit c** used incorrect pTNM codes the most. Only **units a, f, g and j** listed correct codes for the entire pTNM. Registration

**units a, f, g and j** coded according to the 7th edition of the UICC TNM classification of malignant tumours and therefore did not use code pMX. The remaining registries coded according to the 6th edition of the UICC TNM classification of malignant tumours and applied code pMX (19% overall). Registries providing information on the pT, pN and pM categories most frequently coded non-specifically (55%, 60% and 79%, respectively; $p<0.0001$). The range of the corresponding frequencies in the registries was extremely wide (85%, 87% and 44%, respectively). The proportions of non-specific assignments were extremely low in **unit m,** and **unit h** had even no such assignment. These units had higher proportions of the codes pTX, pNX and pMX. The proportions of non-specific assignments were the highest in **unit b**.
The codes pT2, pN0 and pMX were the second most frequently used of the entire pTNM for prostate cancer (23%, 25% and 19%, respectively) and codes pTX, pNX and pM0 the third most frequently (10%, 13% and 1%, respectively). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.00001$).

Table 51: Prostate cancer: distribution of histological grading codes by registration unit (n=19,836)

| **Grade** | **Registration unit** | | | | | | | | | | | | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| Grade 1, *Gleason 2-4* (n) | 2 | 2 | 23 | - | - | 21 | 13 | 18 | 52 | 30 | - | - | 7 | 168 | 168 |
| (%) | 0.9 | 0.2 | 2.0 | - | - | 1.4 | 1.0 | 1.7 | 1.0 | 1.4 | - | - | 0.5 | 0.9 | 1.1 |
| Grade 2, *Gleason 5-6* (n) | 77 | 155 | 466 | - | - | 540 | 357 | 816 | 1,827 | 1,019 | - | - | 495 | 5,752 | 5,752 |
| (%) | 34.5 | 16.4 | 39.7 | - | - | 36.1 | 26.6 | 77.7 | 34.6 | 47.1 | - | - | 32.4 | 29.0 | 37.8 |
| Grade 3/4, *Gleason 7-10* (n) | 120 | 444 | 570 | - | - | 783 | 896 | 203 | 2,984 | 963 | - | - | 915 | 7,878 | 7,878 |
| (%) | 53.8 | 46.9 | 48.6 | - | - | 52.3 | 66.7 | 19.3 | 56.5 | 44.5 | - | - | 59.8 | 39.7 | 51.8 |
| Grade X (n) | 13 | 1 | 1 | - | - | - | 58 | - | 3 | 70 | - | - | - | 146 | 146 |
| (%) | 5.8 | 0.1 | 0.1 | - | - | - | 4.3 | - | 0.1 | 3.2 | - | - | - | 0.7 | 1.0 |
| Unknown (n) | 11 | 344 | 114 | 292 | 1,215 | 152 | 19 | 13 | 412 | 81 | 2,552 | 575 | 112 | 5,892 | 1,258 |
| (%) | 4.9 | 36.4 | 9.7 | 100.0 | 100.0 | 10.2 | 1.4 | 1.2 | 7.8 | 3.7 | 100.0 | 100.0 | 7.3 | 29.7 | 8.3 |

(%) column percentage Pearson chi2(48) = 1.7e+04, p<0.0001 EMH chi2(48) = 1.0e+04, p<0.00001

[1] registration units with records only, i.e. units d, e, k and l excluded

Table 52: Prostate cancer: distribution of cT-codes (TNM) by registration unit (n=19,836)

| cT-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| T0 (n) | - | 1 | - | - | - | - | 1 | 1 | - | 1 | - | - | 3 | 7 | 7 |
| (%) | - | 0.1 | - | - | - | - | 0.1 | 0.1 | - | 0.1 | - | - | 0.2 | 0.0 | 0.0 |
| **T1- (n)** | **83** | **38** | **145** | **-** | **-** | **448** | **111** | **384** | **2,054** | **311** | **-** | **-** | **373** | **3,947** | **3,947** |
| **(%)** | **37.2** | **4.0** | **12.4** | **-** | **-** | **29.9** | **8.3** | **36.6** | **38.9** | **14.4** | **-** | **-** | **24.4** | **19.9** | **26.0** |
| T1 (%)[1] | - | 5.3 | 4.8 | - | - | 0.2 | 0.9 | 27.6 | 0.2 | 3.2 | - | - | 3.5 | 3.7 | |
| T1a (%)[1] | 16.9 | 26.3 | 7.6 | - | - | 34.6 | 26.1 | 5.5 | 18.2 | 18.6 | - | - | 21.7 | 19.1 | |
| T1b (%)[1] | 6.0 | 7.9 | 3.4 | - | - | 15.4 | 7.2 | 2.9 | 8.5 | 9.3 | - | - | 9.1 | 8.6 | |
| T1b2 (%)[1] | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | 0.0 | |
| T1c (%)[1] | 77.1 | 60.5 | 84.1 | - | - | 49.6 | 65.8 | 64.1 | 73.1 | 68.8 | - | - | 65.7 | 68.7 | |
| **T2- (n)** | **12** | **37** | **168** | **-** | **-** | **95** | **211** | **232** | **407** | **388** | **-** | **-** | **402** | **1,952** | **1,952** |
| **(%)** | **5.4** | **3.9** | **14.3** | **-** | **-** | **6.4** | **15.7** | **22.1** | **7.7** | **17.9** | **-** | **-** | **26.3** | **9.8** | **12.8** |
| T2 (%)[1] | 41.7 | 40.5 | 54.8 | - | - | 27.4 | 2.4 | 61.2 | 76.4 | 65.5 | - | - | 28.6 | 49.4 | |
| T2a (%)[1] | 8.3 | 21.6 | 24.4 | - | - | 12.6 | 20.4 | 6.5 | 5.7 | 7.0 | - | - | 26.1 | 14.1 | |
| T2b (%)[1] | 16.7 | 5.4 | 6.5 | - | - | 16.8 | 8.1 | 5.2 | 4.7 | 10.3 | - | - | 20.6 | 10.3 | |
| T2c (%)[1] | 33.3 | 32.4 | 14.3 | - | - | 43.2 | 69.2 | 27.2 | 13.3 | 17.3 | - | - | 24.6 | 26.1 | |
| **T3- (n)** | **5** | **15** | **63** | **-** | **-** | **106** | **91** | **64** | **215** | **91** | **-** | **-** | **251** | **901** | **901** |
| **(%)** | **2.2** | **1.6** | **5.4** | **-** | **-** | **7.1** | **6.8** | **6.1** | **4.1** | **4.2** | **-** | **-** | **16.4** | **4.5** | **5.9** |
| T3 (%)[1] | 60.0 | 73.3 | 65.1 | - | - | 55.7 | 20.9 | 90.6 | 82.8 | 56.0 | - | - | 31.1 | 55.3 | |
| T3a (%)[1] | - | 6.7 | 15.9 | - | - | 30.2 | 45.1 | 0.0 | 7.4 | 23.1 | - | - | 43.8 | 25.6 | |
| T3b (%)[1] | 40.0 | 20.0 | 19.0 | - | - | 13.2 | 34.1 | 9.4 | 9.8 | 19.8 | - | - | 25.1 | 18.9 | |
| T3c (%)[1] | - | - | - | - | - | 0.9 | - | - | - | 1.1 | - | - | - | 0.2 | |
| T4- (n) | 1 | 3 | 5 | - | - | 43 | 7 | 7 | 83 | 23 | - | - | 45 | 217 | 217 |
| (%) | 0.5 | 0.3 | 0.4 | - | - | 2.9 | 0.5 | 0.7 | 1.6 | 1.1 | - | - | 2.9 | 1.1 | 1.4 |
| TX (n) | 1 | 35 | 3 | - | - | 68 | 35 | 362 | 259 | 18 | - | - | 438 | 1,219 | 1,219 |
| (%) | 0.5 | 3.7 | 0.3 | - | - | 4.6 | 2.6 | 34.5 | 4.9 | 0.8 | - | - | 28.7 | 6.2 | 8.0 |
| Unknown (n) | 121 | 817 | 790 | 292 | 1,215 | 736 | 887 | - | 2,260 | 1,331 | 2,552 | 575 | 17 | 11,593 | 6,959 |
| (%) | 54.3 | 86.4 | 67.3 | 100.0 | 100.0 | 49.2 | 66.1 | - | 42.8 | 61.5 | 100.0 | 100.0 | 1.1 | 58.4 | 45.8 |

(%) column percentage of total n

(%)[1] column percentage per n of cT-code (T1-T3)

[2] registration units with records only, i.e. units d, e, k and l excluded

Pearson chi2(192) = 1.4e+04, p<0.0001

EMH chi2(72) = 9.1e+03, p<0.00001 (collapsed to main categories)

Table 53: Prostate cancer: distribution of cN-codes (TNM) by registration unit (n=19,836)

| cN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| N0 (n) | 98 | 62 | 234 | - | - | 426 | 363 | 411 | 2,725 | 746 | - | - | 920 | 5,985 | 5,985 |
| (%) | 44.0 | 6.6 | 19.9 | - | - | 28.5 | 27.0 | 39.1 | 51.6 | 34.5 | - | - | 60.2 | 30.2 | 39.4 |
| N1 (n) | 4 | 10 | 21 | - | - | 41 | 39 | 20 | 128 | 67 | - | - | 97 | 427 | 427 |
| (%) | 1.8 | 1.1 | 1.8 | - | - | 2.7 | 2.9 | 1.9 | 2.4 | 3.1 | - | - | 6.3 | 2.2 | 2.8 |
| N2 (n) | - | - | 3 | - | - | 3 | - | 1 | 3 | - | - | - | - | 10 | 10 |
| (%) | - | - | 0.3 | - | - | 0.2 | - | 0.1 | 0.1 | - | - | - | - | 0.1 | 0.1 |
| N3 (n) | - | 1 | - | - | - | - | - | - | - | - | - | - | 2 | 3 | 3 |
| (%) | - | 0.1 | - | - | - | - | - | - | - | - | - | - | 0.1 | 0.0 | 0.0 |
| NX (n) | - | 52 | 120 | - | - | 406 | 54 | 618 | 575 | 19 | - | - | 493 | 2,337 | 2,337 |
| (%) | - | 5.5 | 10.2 | - | - | 27.1 | 4.0 | 58.9 | 10.9 | 0.9 | - | - | 32.2 | 11.8 | 15.4 |
| Unknown (n) | 121 | 821 | 796 | 292 | 1,215 | 620 | 887 | - | 1,847 | 1,331 | 2,552 | 575 | 17 | 11,074 | 6,440 |
| (%) | 54.3 | 86.8 | 67.8 | 100.0 | 100.0 | 41.4 | 66.1 | - | 35.0 | 61.5 | 100.0 | 100.0 | 1.1 | 55.8 | 42.4 |

(%) column percentage Pearson chi2(60) = 1.1e+04, p<0.0001 EMH chi2(36) = 8.3e+03, p<0.00001 (N2 and N3 to category unknown collapsed)

[1] registration units with records only, i.e. units d, e, k and l excluded

Table 54: Prostate cancer: distribution of cM-codes (TNM) by registration unit (n=19,836)

| cM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| M0 (n) | 100 | 75 | 417 | - | - | 784 | 423 | 980 | 4,324 | 745 | - | - | 802 | 8,650 | 8,650 |
| (%) | 44.8 | 7.9 | 35.5 | - | - | 52.4 | 31.5 | 93.3 | 81.9 | 34.4 | - | - | 52.5 | 43.6 | 56.9 |
| **M1 (n)** | **9** | **12** | **51** | **-** | **-** | **109** | **33** | **24** | **274** | **79** | **-** | **-** | **145** | **736** | **736** |
| **(%)** | **4.0** | **1.3** | **4.3** | **-** | **-** | **7.3** | **2.5** | **2.3** | **5.2** | **3.7** | **-** | **-** | **9.5** | **3.7** | **4.8** |
| M1 (%)[1] | 55.6 | 58.3 | 92.2 | - | - | 15.6 | 6.1 | 100.0 | 47.1 | 54.4 | - | - | 69.7 | 51.0 | |
| M1a (%)[1] | 11.1 | - | - | - | - | 3.7 | 12.1 | - | 2.9 | 5.1 | - | - | 6.9 | 4.2 | |
| M1b (%)[1] | 33.3 | 33.3 | 5.9 | - | - | 64.2 | 69.7 | - | 46.4 | 36.7 | - | - | 22.1 | 39.5 | |
| M1c (%)[1] | - | 8.3 | 2.0 | - | - | 16.5 | 12.1 | - | 3.6 | 3.8 | - | - | 1.4 | 5.3 | |
| MX (n) | 3 | 38 | 174 | - | - | 499 | - | 46 | 347 | 8 | - | - | 582 | 1,697 | 1,697 |
| (%) | 1.4 | 4.0 | 14.8 | - | - | 33.4 | - | 4.4 | 6.6 | 0.4 | - | - | 38.1 | 8.6 | 11.2 |
| Unknown (n) | 111 | 821 | 532 | 292 | 1,215 | 104 | 887 | - | 333 | 1,331 | 2,552 | 575 | - | 8,753 | 4,119 |
| (%) | 49.8 | 86.8 | 45.3 | 100.0 | 100.0 | 7.0 | 66.1 | - | 6.3 | 61.5 | 100.0 | 100.0 | - | 44.1 | 27.1 |

(%) column percentage of total n Pearson chi2(72) = 1.6e+044, p<0.0001

(%)[1] column percentage per n of cM-code (M1) EMH chi2(72) = 1.2e+04, p<0.00001

[2] registration units with records only, i.e. units d, e, k and l excluded

Table 55: Prostate cancer: distribution of pT-codes (TNM) by registration unit (n=19,836)

| pT-code | | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| **T1- (n)** | | **2** | **3** | **110** | **-** | **-** | **97** | **1** | **50** | **101** | **-** | **-** | **-** | **31** | **395** | **395** |
| **(%)** | | **0.9** | **0.3** | **9.4** | **-** | **-** | **6.5** | **0.1** | **4.8** | **1.9** | **-** | **-** | **-** | **2.0** | **2.0** | **2.6** |
| | T1 (%)[1] | - | 0.0 | 1.8 | - | - | - | 100.0 | 10.0 | 7.9 | - | - | - | 12.9 | 5.1 | |
| | T1a (%)[1] | 50.0 | 66.7 | 44.5 | - | - | 56.7 | 0.0 | 46.0 | 64.4 | - | - | - | 74.2 | 55.2 | |
| | T1b (%)[1] | 50.0 | 33.3 | 12.7 | - | - | 26.8 | 0.0 | 14.0 | 22.8 | - | - | - | 6.5 | 18.7 | |
| | T1c (%)[1] | - | - | 40.9 | - | - | 16.5 | 0.0 | 30.0 | 5.0 | - | - | - | 6.5 | 21.0 | |
| **T2- (n)** | | **60** | **50** | **349** | **-** | **-** | **420** | **171** | **291** | **1,430** | **249** | **-** | **-** | **427** | **3,447** | **3,447** |
| **(%)** | | **26.9** | **5.3** | **29.7** | **-** | **-** | **28.1** | **12.7** | **27.7** | **27.1** | **11.5** | **-** | **-** | **27.9** | **17.4** | **22.7** |
| | T2 (%)[1] | - | 2.0 | 1.7 | - | - | 0.5 | - | 2.1 | 4.3 | 1.6 | - | - | 0.7 | 2.4 | |
| | T2a (%)[1] | 3.3 | 14.0 | 13.8 | - | - | 11.9 | 17.5 | 18.6 | 16.5 | 16.9 | - | - | 17.8 | 15.8 | |
| | T2b (%)[1] | 5.0 | 2.0 | 0.9 | - | - | 1.9 | 7.6 | 3.4 | 3.1 | 3.6 | - | - | 4.4 | 3.2 | |
| | T2c (%)[1] | 91.7 | 82.0 | 83.7 | - | - | 85.7 | 74.9 | 75.9 | 76.2 | 77.9 | - | - | 77.0 | 78.6 | |
| **T3- (n)** | | **32** | **15** | **144** | **-** | **-** | **162** | **47** | **104** | **566** | **126** | **-** | **-** | **176** | **1,372** | **1,372** |
| **(%)** | | **14.3** | **1.6** | **12.3** | **-** | **-** | **10.8** | **3.5** | **9.9** | **10.7** | **5.8** | **-** | **-** | **11.5** | **6.9** | **9.0** |
| | T3 (%)[1] | - | 6.7 | 2.8 | - | - | 1.9 | 0.0 | 6.7 | 5.7 | 0.8 | - | - | 0.0 | 3.5 | |
| | T3a (%)[1] | 68.8 | 60.0 | 54.2 | - | - | 58.6 | 66.0 | 50.0 | 60.2 | 64.3 | - | - | 65.3 | 60.1 | |
| | T3b (%)[1] | 31.3 | 33.3 | 42.4 | - | - | 39.5 | 34.0 | 43.3 | 33.2 | 34.9 | - | - | 34.1 | 35.9 | |
| | T3c (%)[1] | - | - | 0.7 | - | - | - | - | - | 0.9 | - | - | - | 0.6 | 0.5 | |
| T4- (n) | | 3 | - | 3 | - | - | 3 | 1 | 6 | 11 | 1 | - | - | 6 | 34 | 34 |
| (%) | | 1.4 | - | 0.3 | - | - | 0.2 | 0.1 | 0.6 | 0.2 | 0.1 | - | - | 0.4 | 0.2 | 0.2 |
| TX (n) | | - | 66 | 13 | - | - | 1 | - | 599 | 12 | - | - | - | 876 | 1,567 | 1,567 |
| (%) | | - | 7.0 | 1.1 | - | - | 0.1 | - | 57.1 | 0.2 | - | - | - | 57.3 | 7.9 | 10.3 |
| Ta (n) | | - | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| (%) | | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - | 0.0 | 0.0 |
| Tis- (n) | | - | 1 | 20 | - | - | - | - | - | - | - | - | - | - | 21 | 21 |
| (%) | | - | 0.1 | 1.7 | - | - | - | - | - | - | - | - | - | - | 0.1 | 0.1 |
| Unknown (n) | | 126 | 811 | 534 | 292 | 1,215 | 813 | 1,123 | - | 3,158 | 1,787 | 2,552 | 575 | 13 | 12,999 | 8,365 |
| (%) | | 56.5 | 85.7 | 45.5 | 100.0 | 100.0 | 54.3 | 83.6 | - | 59.8 | 82.6 | 100.0 | 100.0 | 0.9 | 65.5 | 55.0 |

(%) column percentage of total n

(%)[1] column percentage per n of pT-code (T1 -T3)

[2] registration units with records only, i.e. units d, e, k and l excluded

Pearson chi2(192) = 1.6e+04, p<0.0001

EMH chi2(72) = 1.2e+04, p<0.00001 (collapsed to main categories)

Table 56: Prostate cancer: distribution of pN-codes (TNM) by registration unit (n=19,836)

| pN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| N0 (n) | 90 | 58 | 452 | - | - | 523 | 146 | 312 | 1,517 | 327 | - | - | 356 | 3,781 | 3,781 |
| (%) | 40.4 | 6.1 | 38.5 | - | - | 35.0 | 10.9 | 29.7 | 28.7 | 15.1 | - | - | 23.3 | 19.1 | 24.9 |
| **N1- (n)** | **8** | **7** | **28** | **-** | **-** | **31** | **13** | **38** | **124** | **21** | **-** | **-** | **23** | **293** | **293** |
| **(%)** | **3.6** | **0.7** | **2.4** | **-** | **-** | **2.1** | **1.0** | **3.6** | **2.3** | **1.0** | **-** | **-** | **1.5** | **1.5** | **1.9** |
| N1 (%)[1] | 100.0 | 57.1 | 71.4 | - | - | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | - | - | 100.0 | 96.2 | |
| N1a (%)[1] | - | - | 3.6 | - | - | - | - | - | - | - | - | - | - | 0.3 | |
| N1mi (%)[1] | - | 42.9 | 25.0 | - | - | - | - | - | - | - | - | - | - | 3.4 | |
| NX (n) | - | 67 | 75 | - | - | 8 | - | 700 | 17 | - | - | - | 1,137 | 2,004 | 2,004 |
| (%) | - | 7.1 | 6.4 | - | - | 0.5 | - | 66.7 | 0.3 | - | - | - | 74.4 | 10.1 | 13.2 |
| Unknown (n) | 125 | 814 | 619 | 292 | 1,215 | 934 | 1,184 | - | 3,620 | 1,815 | 2,552 | 575 | 13 | 13,758 | 9,124 |
| (%) | 56.1 | 86.1 | 52.7 | 100.0 | 100.0 | 62.4 | 88.2 | - | 68.6 | 83.9 | 100.0 | 100.0 | 0.9 | 69.4 | 60.0 |

(%) column percentage of total n

Pearson chi2(60) = 1.6e+04 , p<0.0001

(%)[1] column percentage per n of pN-code (N1)

EMH chi2(36) = 1.2e+04, p<0.00001 (collapsed to main categories)

[2] registration units with records only, i.e. units d, e, k and l excluded

Table 57: Prostate cancer: distribution of pM-codes (TNM) by registration unit (n=19,836)

| pM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 | 15,202 |
| M0 (n) | 94 | 6 | 5 | - | - | - | - | 21 | 56 | - | - | - | 6 | 188 | 188 |
| (%) | 42.2 | 0.6 | 0.4 | - | - | - | - | 2.0 | 1.1 | - | - | - | 0.4 | 1.0 | 1.2 |
| **M1- (n)** | **4** | **3** | **6** | **-** | **-** | **4** | **2** | **10** | **15** | **5** | **-** | **-** | **20** | **69** | **69** |
| **(%)** | **1.8** | **0.3** | **0.5** | **-** | **-** | **0.3** | **0.1** | **1.0** | **0.3** | **0.2** | **-** | **-** | **1.3** | **0.3** | **0.5** |
| M1 (%)[1] | 25.0 | 33.3 | 83.3 | - | - | 50.0 | - | 100.0 | 53.3 | 60.0 | - | - | 95.0 | 71.0 | |
| M1a (%)[1] | - | - | 16.7 | - | - | - | - | - | - | - | - | - | - | 1.4 | |
| M1b (%)[1] | 25.0 | 33.3 | - | - | - | 50.0 | - | - | 40.0 | 40.0 | - | - | 5.0 | 18.8 | |
| M1c (%)[1] | 50.0 | 33.3 | - | - | - | - | 100.0 | - | 6.7 | - | - | - | - | 8.7 | |
| MX (n) | - | 117 | 312 | - | - | - | - | 1,019 | 1 | - | - | - | 1,503 | 2,952 | 2,952 |
| (%) | - | 12.4 | 26.6 | - | - | - | - | 97.1 | 0.02 | - | - | - | 98.3 | 14.9 | 19.4 |
| Unknown (n) | 125 | 820 | 851 | 292 | 1,215 | 1,492 | 1,341 | - | 5,206 | 2,158 | 2,552 | 575 | - | 16,627 | 11,993 |
| (%) | 56.1 | 86.7 | 72.5 | 100.0 | 100.0 | 99.7 | 99.9 | - | 98.6 | 99.8 | 100.0 | 100.0 | - | 83.8 | 78.9 |

(%) column percentage of total n

Pearson chi2(72) = 2.1e+04, p<0.0001

(%)[1] column percentage per n of pM-code (M1)

EMH chi2(36) = 1.6e+04, p<0.00001 (collapsed to main categories)

[2] registration units with records only, i.e. units d, e, k and l excluded

### 3.4.3 Date of diagnosis and treatment data

The distribution of date of prostate cancer diagnosis differed moderately between the registries (table 58). The first quarter of the year was the most frequently recorded (28%), followed by the second (26%), the fourth (24%), and the third quarter (22%). The observed seasonal variation was statistically significant (p<0.0001), also when controlling for sex, age and year of diagnosis (p<0.0001). Assignments of the month of May, October and December as the date of first event varied the most between registries (6-13%, 6-12%, 4-9%, respectively). The observed differences were statistically significant (p<0.0001), also when controlling for the covariates (p=0.0003).

Table 58: Prostate cancer: distribution of date of diagnosis by registration unit (n=19,836)

| Date of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 |
| ***1st quarter (%)*** | ***29.6*** | ***28.2*** | ***29.5*** | ***23.3*** | ***27.0*** | ***28.1*** | ***26.9*** | ***25.1*** | ***27.3*** | ***28.6*** | ***28.9*** | ***25.0*** | ***30.2*** | ***27.9*** |
| January (%) | 11.2 | 9.7 | 10.1 | 7.2 | 9.1 | 8.8 | 9.2 | 9.9 | 10.2 | 9.3 | 9.8 | 8.2 | 10.3 | 9.7 |
| February (%) | 8.1 | 9.0 | 8.8 | 7.9 | 8.2 | 9.5 | 8.8 | 7.4 | 7.5 | 9.7 | 9.3 | 8.5 | 9.9 | 8.6 |
| March (%) | 10.3 | 9.5 | 10.6 | 8.2 | 9.7 | 9.9 | 8.9 | 7.8 | 9.6 | 9.6 | 9.8 | 8.4 | 9.9 | 9.6 |
| ***2nd quarter (%)*** | ***26.5*** | ***26.6*** | ***27.2*** | ***32.5*** | ***31.3*** | ***23.5*** | ***26.3*** | ***28.4*** | ***26.3*** | ***24.9*** | ***25.3*** | ***23.1*** | ***26.9*** | ***26.3*** |
| April (%) | 7.6 | 8.4 | 8.4 | 8.9 | 10.9 | 8.4 | 7.7 | 11.0 | 8.2 | 7.2 | 7.2 | 8.0 | 8.1 | 8.3 |
| Mai (%) | 8.5 | 9.7 | 9.4 | 13.0 | 9.1 | 8.3 | 7.8 | 7.4 | 8.2 | 8.7 | 9.2 | 6.4 | 9.6 | 8.7 |
| June (%) | 10.3 | 8.6 | 9.5 | 10.6 | 11.4 | 6.9 | 10.7 | 10.0 | 9.9 | 9.0 | 8.9 | 8.7 | 9.2 | 9.4 |
| ***3rd quarter (%)*** | ***18.8*** | ***22.1*** | ***21.5*** | ***20.6*** | ***20.6*** | ***23.7*** | ***23.7*** | ***23.1*** | ***22.9*** | ***22.2*** | ***21.8*** | ***22.6*** | ***17.9*** | ***22.1*** |
| July (%) | 7.6 | 8.0 | 7.3 | 6.5 | 5.9 | 7.4 | 7.5 | 8.3 | 7.5 | 7.9 | 6.4 | 7.3 | 6.0 | 7.2 |
| August (%) | 4.9 | 7.2 | 7.3 | 6.2 | 7.1 | 8.8 | 7.9 | 8.0 | 7.3 | 7.1 | 7.7 | 6.6 | 5.6 | 7.3 |
| September (%) | 6.3 | 6.9 | 6.8 | 7.9 | 7.6 | 7.5 | 8.3 | 6.8 | 8.1 | 7.3 | 7.6 | 8.7 | 6.3 | 7.5 |
| ***4th quarter (%)*** | ***25.1*** | ***23.0*** | ***21.9*** | ***23.6*** | ***21.2*** | ***24.7*** | ***23.2*** | ***23.4*** | ***23.5*** | ***24.3*** | ***24.0*** | ***29.2*** | ***25.1*** | ***23.8*** |
| October (%) | 11.7 | 6.8 | 6.4 | 8.9 | 8.7 | 7.8 | 6.8 | 8.3 | 6.7 | 7.6 | 6.3 | 10.3 | 8.0 | 7.3 |
| November (%) | 9.4 | 9.9 | 9.2 | 7.2 | 6.1 | 8.7 | 9.0 | 8.4 | 9.5 | 9.6 | 10.2 | 9.7 | 9.8 | 9.2 |
| December (%) | 4.0 | 6.3 | 6.3 | 7.5 | 6.3 | 8.2 | 7.4 | 6.8 | 7.3 | 7.1 | 7.5 | 9.2 | 7.3 | 7.2 |

(%) column percentage

| | | |
|---|---|---|
| Quarters: | Pearson chi2(36) = 76.76, p<0.0001 | EMH chi2(36) = 75.6, p<0.0001 |
| Months: | Pearson chi2(132) = 200.65, p<0.0001 | EMH chi2(132) = 194.38, p=0.0003 |

Information on patient treatment represented level 2 data, which meant that the registries could, at their discretion, transmit such information to NICER. **Units a**, **d**, **e**, **h**, **k** and **l** did not provide any treatment data. (Units d, e, k and l did not also provide information on mode of detection, histological grade and TNM stage; additionally unit h on mode of detection). Treatment data were provided by seven registration units (registries b, c, f, g, i, j and m) and for 26% of all prostate cancer diagnoses (table 59). The average treatment number per diagnosis ranged from 0.2 to 1.1 between the registries, with 0.3 treatments overall. Three units had treatment information for a substantial amount of their diagnoses (76-82%). The remaining proportions of treatment information varied more widely (13-31%; p<0.0001). Among all registries which provided treatment data, information was limited to the first treatment in 22% of all cases, to two treatments in 3%, to three treatments in 1% and to four treatments in <1%. **Units c, f, g, i and j** had information up to the fourth treatment of patients, **unit b** up to the third and **unit m** only on the first treatment. The findings remained statistically significant when controlling for sex, age and year of diagnosis (p<0.0001).

Table 59: Prostate cancer: distribution of treatment data by registration unit (n=19,836)

| Treatment | Registation unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 223 | 946 | 1,174 | 292 | 1,215 | 1,496 | 1,343 | 1,050 | 5,278 | 2,163 | 2,552 | 575 | 1,529 | 19,836 |
| No treatment data (n) | 223 | 821 | 237 | 292 | 1,215 | 267 | 977 | 1,050 | 4,531 | 1,492 | 2,552 | 575 | 367 | 14,599 |
| (%) | 100.0 | 86.8 | 20.2 | 100.0 | 100.0 | 17.9 | 72.8 | 100.0 | 85.9 | 69.0 | 100.0 | 100.0 | 24.0 | 73.6 |
| Treatment data (n) | - | 125 | 937 | - | - | 1,229 | 366 | - | 747 | 671 | - | - | 1,162 | 5,237 |
| (%) | - | 13.2 | 79.8 | - | - | 82.2 | 27.3 | - | 14.2 | 31.0 | - | - | 76.0 | 26.4 |
| Average treatment number per case | | 0.2 | 1.1 | | | *1.1* | 0.4 | | 0.2 | *0.4* | | | 0.8 | 0.3 |
| ***1st treatment (n)*** | - | ***103*** | ***674*** | - | - | ***962*** | ***254*** | - | ***659*** | ***538*** | - | - | ***1,162*** | ***4,352*** |
| ***(%)*** | - | ***10.9*** | ***57.4*** | - | - | ***64.3*** | ***18.9*** | - | ***12.5*** | ***24.9*** | - | - | ***76.0*** | ***21.9*** |
| ***2nd treatment (n)*** | - | ***17*** | ***192*** | - | - | ***178*** | ***100*** | - | ***78*** | ***104*** | - | - | - | ***669*** |
| ***(%)*** | - | ***1.8*** | ***16.4*** | - | - | ***11.9*** | ***7.5*** | - | ***1.5*** | ***4.8*** | - | - | - | ***3.4*** |
| ***3rd treatment (n)*** | - | ***5*** | ***62*** | - | - | ***81*** | ***11*** | - | ***9*** | ***26*** | - | - | - | ***194*** |
| ***(%)*** | - | ***0.5*** | ***5.3*** | - | - | ***5.4*** | ***0.8*** | - | ***0.2*** | ***1.2*** | - | - | - | ***1.0*** |
| ***4th treatment (n)*** | - | - | ***9*** | - | - | ***8*** | ***1*** | - | ***1*** | ***3*** | - | - | - | ***22*** |
| ***(%)*** | - | - | ***0.8*** | - | - | ***0.5*** | ***0.1*** | - | ***0.0*** | ***0.1*** | - | - | - | ***0.1*** |
| ***5th treatment (n)*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| ***(%)*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

(%) column percentage Pearson chi2(48) = 9.8e+03, p<0.0001 EMH chi2(48) = 1.0e+04, p<0.00001

## 3.5 Urinary bladder cancer – outcome variables

### 3.5.1 Topography, morphology, mode of detection and basis of diagnosis

The ICD-O-3 ***topography codes*** for urinary bladder cancer (n=6,902) differed negligibly between the sexes (p=0.173). Non-specific coding using C67.9 'bladder, NOS' increased with the age of patients, from 60% (age <55) to 65% (age 85+). The proportion of C67.6 'ureteric orifice' decreased from 7% (age <55) to 3% (age 85+) and that of C67.2 'lateral wall' from 16% (age <55) to 12% (age 85+). These results indicate that the very elderly were rather non-specifically coded. The remaining codes varied slightly and inconsistently with age (p<0.0001). The proportion of non-specific topography coding declined steadily from 67% to 61% during 2008-12. In contrast, the coding of C67.6 'ureteric orifice' and C67.2 'lateral wall' rose during 2008-12. This pattern suggests an improvement in coding during 2008-2012. The remaining codes varied only slightly and inconsistently during the observation period (p<0.0001). The registration units (table 60) recorded most frequently C67.9 'bladder, NOS' (63%), followed by C67.2 'lateral wall' (14%) and C67.8 'overlapping lesion' (11%; p<0.0001). The proportions of these codes varied extremely between the registries (8-98%, 2-30% and <1-38%, respectively). The proportion of non-specific coding of topography was lowest in **unit d** and highest in **unit e**. The proportions of the codes remained statistically significantly different when controlling for sex, age and year of diagnosis (p<0.00001).

The ICD-O-3 ***morphology codes*** hardly varied by sex, except for the category 'transitional cell papilloma and carcinoma', which was the most frequently recorded for men (96%) and women (91%; p<0.0001). Whereas transitional cell papillomas and carcinomas were more common among younger (e.g. 96% in the age group 55-64) than among older patients (89% in the age group 85+), unspecified urinary bladder neoplasms (non-specific coding) were more common among older (9% in the age group 85+) than among younger patients (1-3% in patients younger up to age 84). These findings indicate that the very elderly were rather non-specifically coded. The remaining morphological codes did not substantially differ between the age groups (p<0.0001). All codes hardly varied with increasing year of diagnosis (p=0.665).

The registration units (table 61) assigned most frequently the category 'transitional cell papilloma and carcinoma' (94%), in a narrow range between the registries (91-96%). Non-specific morphology coding accounted only for 3% of all cases and ranged from 2% in **unit j** to 6% in **unit d**. The proportions of the remaining categories hardly varied between the units ($p<0.0001$). These results remained statistically significant when controlling for sex, age, year of diagnosis and *mode of detection* ($p=0.0003$). The detection method of transitional cell papillomas and carcinomas, and that of unspecified neoplasms was primarily unknown (73% and 68%, respectively). These tumours were second most frequently detected by symptoms (22% and 25%, respectively) and third most frequently by incidental findings (3% both; $\chi^2(20) = 165.85$, $p<0.0001$).

The ***method of first detection of tumour*** represented level 2 information. To provide NICER with such information was not mandatory during the time period under study. **Units d, e, h, k and l** provided no such information. Therefore, their urinary bladder cancer diagnoses were excluded from the analyses of the distribution of codes ***by registration unit***. The codes differed negligibly between the sexes ($p=0.058$). The proportions of all categories of detection method did not substantially differ between the age groups ($p=0.165$). However, the proportion of urinary bladder cancer detected following symptoms by the patients was the highest among patients aged 85+ years (24%) and the lowest among patients aged 75-84 years (21%). The proportion of diagnoses with unknown mode of detection showed an opposite pattern, with 74% of the patients in the age group 75-84 and 71% in the age group 85+. In addition, the proportion of unknown mode of detection was also high among patients aged younger than 55 years (73%). The proportion of diagnoses with unknown mode of detection fell from 78% to 67% during 2010-12 ($p<0.0001$). This pattern suggests a more precise coding of the detection mode in 2012, which is supported by an increase of symptomatic detection from 19% to 28% during 2010-12. The detection mode of urinary bladder cancers was primarily unknown (65%; table 61) and ranged from 12% in **unit c** to 89% in **unit b** ($p<0.00001$). The proportion of urinary bladder cancers detected following symptoms by the patient was the second highest overall (29%) and also varied extremely between the registries, from 7% in **unit b** to 78% in **unit c**. Incidental findings accounted only for 5% of all detection methods but varied widely between the registries (1-20%). The proportions of the codes remained statistically significantly different when controlling for sex, age and year of diagnosis ($p<0.00001$).

The ***basis of diagnosis codes*** differed negligibly between the sexes ($p<0.0001$), with almost equal proportions in the category 'histology of primarily tumour', which was assigned in 96% of all cases (table 63). The proportion of 'histology of primary tumour' fell steadily with increasing age of patients, from 98% (age <55) to 88% (age 85+). In contrast, the proportions of the categories 'cytology', 'clinical investigation' and DCO increased primarily in the 85+ age group ($p<0.0001$). All codes hardly differed by year of diagnosis ($p<0.0001$). However, assignments of the code 'histology of primary tumour' rose slightly by 2% to 97% during the observation period. All cancer registries had well differentiated records of the microscopic proportion, since it represents an international quality criterion. Therefore, non-specific coding of basis of diagnosis resulted only in 0.3% ($p<0.0001$). The proportions of codes remained statistically significantly different when controlling for sex, age and year of diagnosis ($p<0.00001$).

Table 60: Urinary bladder cancer: distribution of ICD-O-3 topography codes by registration unit (n=6,902)

| Topography code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| C67.0 Trigone (n) | 5 | 11 | 6 | 3 | 2 | 37 | 2 | 3 | 20 | 2 | 6 | 6 | 31 | 134 |
| (%) | 7.4 | 2.8 | 1.6 | 3.6 | 0.5 | 6.8 | 0.5 | 0.8 | 1.0 | 0.3 | 1.1 | 3.0 | 4.4 | 1.9 |
| C67.1 Dome (n) | 2 | 4 | 3 | 3 | 1 | 15 | 2 | 3 | 25 | 5 | 6 | 2 | 7 | 78 |
| (%) | 2.9 | 1.0 | 0.8 | 3.6 | 0.3 | 2.8 | 0.5 | 0.8 | 1.2 | 0.7 | 1.1 | 1.0 | 1.0 | 1.1 |
| C67.2 Lateral wall (n) | 18 | 36 | 92 | 18 | - | 119 | 7 | 14 | 276 | 104 | 89 | 60 | 147 | 980 |
| (%) | 26.5 | 9.2 | 24.8 | 21.7 | - | 21.9 | 1.8 | 3.8 | 13.1 | 14.1 | 15.9 | 30.2 | 21.0 | 14.2 |
| C67.3 Anterior wall (n) | - | 2 | - | 1 | - | 8 | - | 2 | 5 | 2 | 2 | 7 | 5 | 34 |
| (%) | - | 0.5 | - | 1.2 | - | 1.5 | - | 0.5 | 0.2 | 0.3 | 0.4 | 3.5 | 0.7 | 0.5 |
| C67.4 Posterior wall (n) | 1 | 11 | 18 | 12 | 3 | 28 | 2 | 5 | 54 | 31 | 14 | 14 | 26 | 219 |
| (%) | 1.5 | 2.8 | 4.9 | 14.5 | 0.8 | 5.2 | 0.5 | 1.4 | 2.6 | 4.2 | 2.5 | 7.0 | 3.7 | 3.2 |
| C67.5 Bladder neck (n) | 5 | 11 | 5 | 3 | - | 4 | 3 | 9 | 14 | 7 | 4 | 7 | 8 | 80 |
| (%) | 7.4 | 2.8 | 1.4 | 3.6 | - | 0.7 | 0.8 | 2.4 | 0.7 | 1.0 | 0.7 | 3.5 | 1.1 | 1.2 |
| C67.6 Ureteric orifice (n) | 2 | 9 | 24 | 9 | - | 21 | 14 | - | 128 | 9 | 16 | 8 | 20 | 260 |
| (%) | 2.9 | 2.3 | 6.5 | 10.8 | - | 3.9 | 3.6 | - | 6.1 | 1.2 | 2.9 | 4.0 | 2.9 | 3.8 |
| C67.7 Urachus (n) | - | - | 1 | - | - | 1 | - | - | 2 | - | 2 | 1 | 3 | 10 |
| (%) | - | - | 0.3 | - | - | 0.2 | - | - | 0.1 | - | 0.4 | 0.5 | 0.4 | 0.1 |
| C67.8 Overlapping lesion (n) | 18 | 97 | 82 | 27 | 1 | 103 | 2 | 53 | 31 | 44 | 105 | 76 | 119 | 758 |
| (%) | 26.5 | 24.8 | 22.1 | 32.5 | 0.3 | 19.0 | 0.5 | 14.3 | 1.5 | 6.0 | 18.8 | 38.2 | 17.0 | 11.0 |
| C67.9 Bladder, NOS (n) | 17 | 210 | 140 | 7 | 371 | 207 | 362 | 282 | 1,551 | 533 | 316 | 18 | 335 | 4,349 |
| (%) | 25.0 | 53.7 | 37.7 | 8.4 | 98.2 | 38.1 | 91.9 | 76.0 | 73.7 | 72.3 | 56.4 | 9.1 | 47.8 | 63.0 |

(%) column percentage Pearson chi2(108) = 1.8e+03, p<0.0001 EMH chi2(108) = 1.8e+03, p<0.00001

Table 61: Urinary bladder cancer: distribution of ICD-O-3 morphology codes by registration unit (n=6,902)

| Morphology code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| Squamous cell neoplasms (n) | 2 | 7 | 21 | - | 7 | 5 | 6 | 6 | 21 | 12 | 12 | - | 9 | 108 |
| (%) | 2.9 | 1.8 | 5.7 | - | 1.9 | 0.9 | 1.5 | 1.6 | 1.0 | 1.6 | 2.1 | - | 1.3 | 1.6 |
| Transitional cell papilloma (n) | 62 | 364 | 336 | 77 | 353 | 511 | 374 | 351 | 2,002 | 706 | 524 | 189 | 666 | 6,515 |
| and carcinoma (%) | 91.2 | 93.1 | 90.6 | 92.8 | 93.4 | 94.1 | 94.9 | 94.6 | 95.1 | 95.8 | 93.6 | 95.0 | 95.0 | 94.4 |
| Adenomas / adenocarcinomas (n) | 1 | 2 | 3 | - | 3 | 3 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 38 |
| (%) | 1.5 | 0.5 | 0.8 | - | 0.8 | 0.6 | 0.5 | 0.3 | 0.4 | 0.5 | 0.4 | 0.5 | 1.1 | 0.6 |
| Cystic, mucinous and serous (n) | - | - | 1 | 1 | 1 | 1 | - | - | 5 | - | 1 | 1 | 1 | 12 |
| neoplasms (%) | - | - | 0.3 | 1.2 | 0.3 | 0.2 | - | - | 0.2 | - | 0.2 | 0.5 | 0.1 | 0.2 |
| Other, specified (n) | 1 | - | - | - | 1 | 1 | - | - | 6 | 1 | 1 | - | 3 | 14 |
| (%) | 1.5 | - | - | - | 0.3 | 0.2 | - | - | 0.3 | 0.1 | 0.2 | - | 0.4 | 0.2 |
| Other, unspecified (n) | 2 | 18 | 10 | 5 | 13 | 22 | 12 | 13 | 64 | 14 | 20 | 8 | 14 | 215 |
| (%) | 2.9 | 4.6 | 2.7 | 6.0 | 3.4 | 4.1 | 3.1 | 3.5 | 3.0 | 1.9 | 3.6 | 4.0 | 2.0 | 3.1 |

(%) column percentage Pearson chi2(60) = 99.41, p<0.0001 EMH chi2(60) = 105.28, p=0.0003

Table 62: Urinary bladder cancer: Method of 1st detection of tumour by registration unit (n=6,902)

| Detection | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,311 |
| Symptoms (n) | 10 | 28 | 288 | - | - | 283 | 69 | - | 258 | 129 | - | - | 475 | 1,540 | 1,540 |
| (%) | 14.7 | 7.2 | 77.6 | - | - | 52.1 | 17.5 | - | 12.3 | 17.5 | - | - | 67.8 | 22.3 | 29.0 |
| Incidental (n) | 1 | 6 | 21 | - | - | 64 | 7 | - | 26 | 5 | - | - | 137 | 267 | 267 |
| (%) | 1.5 | 1.5 | 5.7 | - | - | 11.8 | 1.8 | - | 1.2 | 0.7 | - | - | 19.5 | 3.9 | 5.0 |
| Screening (n) | 5 | 5 | 16 | - | - | 14 | 1 | - | 14 | - | - | - | - | 55 | 55 |
| (%) | 7.4 | 1.3 | 4.3 | - | - | 2.6 | 0.3 | - | 0.7 | - | - | - | - | 0.8 | 1.0 |
| Other (n) | - | 3 | 1 | - | - | - | - | - | 12 | - | - | - | 1 | 17 | 17 |
| (%) | - | 0.8 | 0.3 | - | - | - | - | - | 0.6 | - | - | - | 0.1 | 0.3 | 0.3 |
| Unknown (n) | 52 | 349 | 45 | 83 | 378 | 182 | 317 | 371 | 1,796 | 603 | 560 | 199 | 88 | 5,023 | 3,432 |
| (%) | 76.5 | 89.3 | 12.1 | 100.0 | 100.0 | 33.5 | 80.5 | 100.0 | 85.3 | 81.8 | 100.0 | 100.0 | 12.6 | 72.8 | 64.6 |

(%) column percentage Pearson chi2(48) = 3.6e+03, p<0.0001 EMH chi2(48) = 3.6e+03, p<0.00001

[1] registration units with records only, i.e. units d, e, h, k and l excluded

Table 63: Urinary bladder cancer: distribution of basis of diagnosis codes by registration unit (n=6,902)

| Basis of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| DCO (n) | 1 | 4 | - | - | - | - | - | - | 22 | 2 | 6 | 1 | 1 | 37 |
| (%) | 1.5 | 1.0 | - | - | - | - | - | - | 1.0 | 0.3 | 1.1 | 0.5 | 0.1 | 0.5 |
| Clinical (n) | - | - | - | 4 | 1 | - | 1 | - | 3 | - | 11 | 2 | - | 22 |
| (%) | - | - | - | 4.8 | 0.3 | - | 0.3 | - | 0.1 | - | 2.0 | 1.0 | - | 0.3 |
| Clinical investigation (n) | 1 | 7 | 7 | - | 8 | 10 | - | - | 21 | 4 | - | - | 3 | 61 |
| (%) | 1.5 | 1.8 | 1.9 | - | 2.1 | 1.8 | - | - | 1.0 | 0.5 | - | - | 0.4 | 0.9 |
| Tumour markers (n) | - | - | - | - | - | - | 5 | - | - | - | - | - | - | 5 |
| (%) | - | - | - | - | - | - | 1.3 | - | - | - | - | - | - | 0.1 |
| Cytology (n) | 1 | 6 | 1 | 3 | 5 | 5 | 2 | 12 | 36 | 10 | 4 | - | 39 | 124 |
| (%) | 1.5 | 1.5 | 0.3 | 3.6 | 1.3 | 0.9 | 0.5 | 3.2 | 1.7 | 1.4 | 0.7 | - | 5.6 | 1.8 |
| Histology of metastasis (n) | - | 1 | - | - | 4 | 3 | - | - | - | 2 | 3 | 1 | - | 14 |
| (%) | - | 0.3 | - | - | 1.1 | 0.6 | - | - | - | 0.3 | 0.5 | 0.5 | - | 0.2 |
| Histology of primary tumour (n) | 65 | 369 | 363 | 76 | 360 | 525 | 386 | 359 | 2,010 | 718 | 536 | 195 | 658 | 6,620 |
| (%) | 95.6 | 94.4 | 97.8 | 91.6 | 95.2 | 96.7 | 98.0 | 96.8 | 95.4 | 97.4 | 95.7 | 98.0 | 93.9 | 95.9 |
| Unknown (n) | - | 4 | - | - | - | - | - | - | 14 | 1 | - | - | - | 19 |
| (%) | - | 1.0 | - | - | - | - | - | - | 0.7 | 0.1 | - | - | - | 0.3 |

(%) column percentage

Pearson chi2(84) = 407.50, p<0.0001 EMH chi2 (72) = 291.02, p<0.00001 (collapsed category: tumour markers added to unknown)

### 3.5.2 Grade and TNM staging

Histological grade and TNM staging information corresponded to level 2 data. The cancer registries were not obliged to provide NICER with such information. Due to missing classification information, urinary bladder cancer diagnoses of the **units d, e, k and l** fell into the category 'unknown' and were excluded from the analyses of the distribution of codes ***by registration unit.***

The ***histological grading codes*** for urinary bladder cancer differed negligibly between the sexes (p=0.016). The proportions of diagnoses assigned grade 1 and grade 2 decreased consistently with increasing age of patients, from 18% (<55) to 9 % (age 85+) and from 25% (<55) to 15% (age 85+). In contrast, the proportions of diagnoses assigned grade 3 increased steadily from 24% (<55) to 38% (age 85+). Also, non-specific coding of histological grade rose from 31% (age 55-64) to 38% (age 85+) and confirms an age gradient, which was already observed with the outcome variables topography and morphology (p<0.0001). The proportions of grade X (undetermined grade) varied in a narrow range between the age groups (0.2-0.7%). All grading codes differed less than 6% with increasing year of diagnoses (p<0.0001). Nevertheless, the proportion of non-specific coding of histological grade declined steadily from 38% to 32% during 2010-12. By comparison, the assignments of the remaining grading codes increased during 2010-12. This pattern is similar to that already observed with outcome variables topography and morphology, and supports the assumption of an improvement in coding during 2010-12. Of all codes, grade 3 was the most frequently assigned (40%), within a range of 18-49% between the registries (table 64; p<0.0001). Grade 2 was the second most frequently recorded (24%) and grade 1 the fourth most frequently (16%). The corresponding proportions varied widely between the registries (5-38% and 1-33%, respectively). Non-specific coding of histological grade ranged from 1% in **unit g** to 66% in **unit b** and was the third most frequently assigned code (20%). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.00001). Urinary bladder cancer assignments of grade 1, grade 2, grade 3, grade X or unknown grade were the most frequent if the detection method was unknown (60-86%) and second most frequent in the case of tumour symptoms (10-36%; $\chi^2(16) = 603.38$; p<0.0001).

The ***cTNM codes*** for urinary bladder cancer differed negligibly between the sexes (p>0.05). The codes cT2, cTX, cNX and cMX became the most frequently recorded with increasing age of patients, with proportions of 5% (+3%), 5% (+13%), 14% (+7%) and 8% (+3%), respectively, in the age group 85+ (p<0.0001). In contrast, proportions of assignments of codes cN0 and cM0 decreased steadily with increasing age of the patient, by 9% to 23% (age 85+) and by 9% to 29% (age 85+), respectively. Non-specific coding of the cT category also decreased from 84% to 77% (age 85+). However, non-specific coding of the cN category increased from 59% (age 65-74) to 63% (age 85+) and that of cM category from 55% (age 55-64) to 62% (age 85+). Non-specific coding of the clinical T category rose steadily from 76% to 83% during 2008-12, whereas that of the cN and cM categories decreased strongly from 71% to 50% and from 68% to 22%, respectively, but only from 2010 to 2011 (p <0.0001). In contrast, the remaining cTNM categories were more frequently coded during the years in question. These results suggest a partial improvement in coding of cTNM until 2011. Non-specific coding of all clinical TNM categories for urinary bladder cancer was the highest if the detection method was unknown (83-90%) and the second highest in the case of tumour symptoms (8-15%). Apart from Code cTX, which was primarily assigned if the method of detection was unknown (57%), the remaining cT codes were applied if the tumour was detected following symptoms by the patient (42-78%; ($\chi^2(32) = 1.7e+03$, p<0.0001). Codes

cN1-3, cM1 and cMX were also primarily assigned if the urinary bladder cancer was detected by tumour symptoms (50-75%) and the codes cN0, cNX and cM0 in the case of no information on the detection method (50-53%; $\chi^2(20) = 1.4e+03$, $p<0.0001$; $\chi^2(12) = 1.6e+03$, $p<0.0001$).

The ***pTNM codes*** for urinary bladder cancer differed moderately between the sexes, with proportion of the codes being statistically significant only for pT ($p<0.0001$). Non-specific coding of the pT and pN category became the most frequent assignment with increasing age of patients, with proportions of 46% (+9%) and 79% (+5%) in the age group 85+ ($p<0.0001$). Assignments of the codes pTX, pNX and pMX also increased with age. In contrast, proportions of the codes pTa and pN0, and non-specific coding of the pM category decreased with age. Non-specific coding of the pathological TNM increased inconsistently during 2008-11. Nevertheless, a decline of the corresponding proportions was observed in 2012. The proportions of pTa, pTX, pNX and pMX declined during 2008-12. The remaining pTNM categories were more frequently coded during the years in question. These results suggest a partial improvement in coding of pTNM until 2012. Non-specific coding of all pathological TNM categories for prostate cancer was the highest if the detection method was unknown (80-96%) and second highest in the case of tumour symptoms (3-17%). Codes pT0, pT4, pTX, pN1, pNX, pM1 and pMX were the most frequently applied if the prostate cancer was detected following symptoms by the patient (51-82%). The method of first detection of tumour was primarily unknown for the remaining pTNM codes ($\chi^2(32) = 1.6e+03$, $p<0.0001$; $\chi^2(20) = 1.3e+03$, $p<0.0001$; 20%, $\chi^2(2) = 1.3e+03$, $p<0.0001$)

Tables 65-67 present the distribution of ***the cTNM codes for urinary bladder by registration unit***. Less than 1% of all urinary cancer diagnoses were not coded according to the clinical TNM classification, as some registries also assigned the codes ‘T1a-c’, ‘T2c’ and ‘M1b’. All registration units coded according to the clinical N classification. **Unit m** used incorrect cTNM codes the most. **Units a, b, g, h, i and j** listed correct codes for the entire cTNM. Only registration **unit g** coded according to the 7th edition of the UICC TNM classification of malignant tumours and therefore avoided to assign code cMX. The remaining registries coded according to the 6th edition of the UICC TNM classification of malignant tumours and used code cMX (7% overall). Registries providing information on the cT, cN and cM categories most frequently coded non-specifically (75%, 52% and 48%, respectively; $p<0.0001$). The range of the corresponding frequencies in the registries was extremely wide (98%, 91% and 88%, respectively). The proportions of non-specific assignments were extremely low in **unit m,** and **unit h** had even no such assignment. These units had higher proportions of the codes cTX, cNX and cMX. The proportions of non-specific assignments were the highest in **unit b and i**. The codes cTa (non-invasive papillary carcinoma), cN0 and cM0 were the second most frequently recorded of the entire cTNM (9%, 36% and 43%, respectively) and the codes cT1, cNX and cMX the third most frequently (5%, 10% and 7%, respectively). Proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.00001$).

Tables 68-70 present the distribution of the ***p*TNM *codes for urinary bladder cancer by cancer registries***. Less than 1% of all urinary bladder cancer diagnoses were not coded according to the pathological TNM classification, as some registries also assigned the codes ‘T1a-c’, ‘T1mic’ and ‘T2c’. All cancer registries coded according to the pN and pM classification. **Unit c** and **m** used incorrect pT codes the most. Only **units a, g and h** listed correct codes for the entire pTNM. Registration **unit f and j** coded according to the 7th edition of the UICC TNM classification of malignant tumours and therefore did not use code pMX. The remaining registries coded according to the 6th edition of the UICC TNM classification of

malignant tumours and applied code pMX (18% overall). Registries providing information on the pT category most frequently assigned the code pTa (37%; non-invasive papillary carcinoma), second most frequently that the pT category was unknown (26%) and third most frequently code pT1 (17%; p<0.0001). Registries providing information on the pN and pM categories most frequently coded non-specifically (72% and 78%, respectively; p<0.0001). The range of the corresponding frequencies in the registries was extremely wide (97% and 73%, respectively). The proportions of non-specific assignments were extremely low in **unit m,** and **unit h** had even no such assignment. These units had higher proportions of the codes pTX, pNX and pMX. The proportions of non-specific assignments were the highest in **unit b and j**. The codes pNX and pMX were the second most frequently used of the pN and pM categories for prostate cancer (16% and 18%, respectively) and codes pN0 and pM0 the third most frequently (10% and 3%, respectively). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* (p<0.00001).

Table 64: Urinary bladder cancer: distribution of histological grading codes by registration unit (n=6,902)

| Grade | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| Grade 1 (n) | 4 | 38 | 80 | - | - | 4 | 69 | 2 | 355 | 123 | - | - | 232 | 907 | 907 |
| (%) | 5.9 | 9.7 | 21.6 | - | - | 0.7 | 17.5 | 0.5 | 16.9 | 16.7 | - | - | 33.1 | 13.1 | 16.0 |
| Grade 2 (n) | 23 | 21 | 109 | - | - | 32 | 149 | 36 | 623 | 283 | - | - | 72 | 1,348 | 1,348 |
| (%) | 33.8 | 5.4 | 29.4 | - | - | 5.9 | 37.8 | 9.7 | 29.6 | 38.4 | - | - | 10.3 | 19.5 | 23.7 |
| Grade 3 (n) | 25 | 71 | 139 | - | - | 202 | 164 | 151 | 903 | 291 | - | - | 340 | 2,286 | 2,286 |
| (%) | 36.8 | 18.2 | 37.5 | - | - | 37.2 | 41.6 | 40.7 | 42.9 | 39.5 | - | - | 48.5 | 33.1 | 40.2 |
| Grade X (n) | 1 | 3 | 1 | - | - | - | 7 | - | - | 6 | - | - | - | 18 | 18 |
| (%) | 1.5 | 0.8 | 0.3 | - | - | - | 1.8 | - | - | 0.8 | - | - | - | 0.3 | 0.3 |
| Unknown (n) | 15 | 258 | 42 | 83 | 378 | 305 | 5 | 182 | 225 | 34 | 560 | 199 | 57 | 2,343 | 1,123 |
| (%) | 22.1 | 66.0 | 11.3 | 100.0 | 100.0 | 56.2 | 1.3 | 49.1 | 10.7 | 4.6 | 100.0 | 100.0 | 8.1 | 34.0 | 19.8 |

(%) column percentage Pearson chi2(48) = 9.4e+03, p<0.0001 EMH chi2(48) = 3.9e+03, p<0.00001

[1] registration units with records only, i.e. units d, e, k and l excluded

Table 65: Urinary bladder cancer: distribution of cT-codes (TNM) by registration unit (n=6,902)

| cT-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| T0 (n) | - | - | - | - | - | - | 1 | 6 | - | 7 | - | - | - | 14 | 14 |
| (%) | - | - | - | - | - | - | 0.3 | 1.6 | - | 1.0 | - | - | - | 0.2 | 0.2 |
| **T1- (n)** | **1** | **3** | **-** | **-** | **-** | **2** | **35** | **41** | **-** | **64** | **-** | **-** | **123** | **269** | **269** |
| **(%)** | **1.5** | **0.8** | **-** | **-** | **-** | **0.4** | **8.9** | **11.1** | **-** | **8.7** | **-** | **-** | **17.5** | **3.9** | **4.7** |
| T1 (%)[1] | 100.0 | 100.0 | - | - | - | 100.0 | 100.0 | 100.0 | - | - | - | - | 69.1 | 85.9 | |
| T1a (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 16.3 | 7.4 | |
| T1b (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 4.9 | 2.2 | |
| T1c (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 9.8 | 4.5 | |
| **T2- (n)** | **2** | **3** | **3** | - | **-** | **1** | **26** | **38** | **-** | **33** | - | - | **121** | **227** | **227** |
| **(%)** | **2.9** | **0.8** | **0.8** | - | - | **0.2** | **6.6** | **10.2** | - | **4.5** | - | - | **17.3** | **3.3** | **4.0** |
| T2 (%)[1] | 100.0 | 100.0 | 66.7 | - | - | 100.0 | 46.2 | 97.4 | - | 93.9 | - | - | 80.2 | 81.5 | |
| T2a (%)[1] | - | - | - | - | - | - | 42.3 | 2.6 | - | 3.0 | - | - | 16.5 | 14.5 | |
| T2b (%)[1] | - | - | - | - | - | - | 11.5 | - | - | 3.0 | - | - | 3.3 | 3.5 | |
| T2c (%)[1] | - | - | 33.3 | - | - | - | - | - | - | - | - | - | - | 0.4 | |
| **T3- (n)** | **4** | **4** | **3** | - | **-** | **9** | **9** | **4** | **2** | **17** | - | - | **8** | **60** | **60** |
| **(%)** | **5.9** | **1.0** | **0.8** | - | - | **1.7** | **2.3** | **1.1** | **0.1** | **2.3** | - | - | **1.1** | **0.9** | **1.1** |
| T3 (%)[1] | 100.0 | 75.0 | 66.7 | - | - | 88.9 | 11.1 | 100.0 | 100.0 | 88.2 | - | - | 62.5 | 73.3 | |
| T3a (%)[1] | - | - | 33.3 | - | - | - | 44.4 | - | - | 5.9 | - | - | 25.0 | 13.3 | |
| T3b (%)[1] | - | 25.0 | - | - | - | 11.1 | 44.4 | - | - | 5.9 | - | - | 12.5 | 13.3 | |
| **T4- (n)** | **1** | **-** | **6** | **-** | **-** | **9** | **4** | **5** | **6** | **7** | - | - | **14** | **52** | **52** |
| **(%)** | **1.5** | **-** | **1.6** | **-** | **-** | **1.7** | **1.0** | **1.3** | **0.3** | **0.9** | **-** | **-** | **2.0** | **0.8** | **0.9** |
| T4 (%)[1] | 100.0 | - | 100.0 | - | - | 66.7 | 25.0 | 80.0 | 50.0 | 57.1 | - | - | 50.0 | 61.5 | |
| T4a (%)[1] | - | - | - | - | - | 22.2 | 50.0 | 20.0 | 50.0 | - | - | - | 50.0 | 28.8 | |
| T4b (%)[1] | - | - | - | - | - | 11.1 | 25.0 | - | - | 42.9 | - | - | - | 9.6 | |
| TX (n) | - | 21 | - | - | - | 8 | 4 | 105 | 22 | 6 | - | - | 46 | 212 | 212 |
| (%) | - | 5.4 | - | - | - | 1.5 | 1.0 | 28.3 | 1.0 | 0.8 | - | - | 6.6 | 3.1 | 3.7 |
| Ta (n) | - | 4 | - | - | - | 1 | - | 172 | - | - | - | - | 349 | 526 | 526 |
| (%) | - | 1.0 | - | - | - | 0.2 | - | 46.4 | - | - | - | - | 49.8 | 7.6 | 9.3 |
| Tis (n) | - | - | - | - | - | - | - | - | - | - | - | - | 39 | 39 | 39 |
| (%) | - | - | - | - | - | - | - | - | - | - | - | - | 5.6 | 0.6 | 0.7 |
| Unknown (n) | 60 | 356 | 359 | 83 | 378 | 513 | 315 | - | 2,076 | 603 | 560 | 199 | 1 | 5,503 | 4,283 |
| (%) | 88.2 | 91.1 | 96.8 | 100.0 | 100.0 | 94.5 | 80.0 | - | 98.6 | 81.8 | 100.0 | 100.0 | 0.1 | 79.7 | 75.4 |

(%) column percentage of total n

(%)[1] column percentage per n of cT-code (T1-T4)

[2] registration units with records only, i.e. units d, e, k and l excluded

Pearson chi2(96) = 6.5e+03, p<0.0001

EMH chi2(84) = 4.5e+03, p<0.00001 (collapsed categories: T0 and unknown)

Table 66: Urinary bladder cancer: distribution of cN-codes (TNM) by registration unit (n=6,902)

| cN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| N0 (n) | 9 | 13 | 17 | - | - | 311 | 52 | 235 | 722 | 113 | - | - | 546 | 2,018 | 2,018 |
| (%) | 13.2 | 3.3 | 4.6 | - | - | 57.3 | 13.2 | 63.3 | 34.3 | 15.3 | - | - | 77.9 | 29.2 | 35.5 |
| N1 (n) | - | - | 4 | - | - | 9 | 3 | 5 | 11 | 9 | - | - | 18 | 59 | 59 |
| (%) | - | - | 1.1 | - | - | 1.7 | 0.8 | 1.4 | 0.5 | 1.2 | - | - | 2.6 | 0.9 | 1.0 |
| N2 (n) | 1 | 3 | 3 | - | - | 5 | 4 | 4 | 5 | 7 | - | - | 8 | 40 | 40 |
| (%) | 1.5 | 0.8 | 0.8 | - | - | 0.9 | 1.0 | 1.1 | 0.2 | 1.0 | - | - | 1.1 | 0.6 | 0.7 |
| N3 (n) | 1 | - | - | - | - | 2 | 3 | - | 3 | 1 | - | - | 2 | 12 | 12 |
| (%) | 1.5 | - | - | - | - | 0.4 | 0.8 | - | 0.1 | 0.1 | - | - | 0.3 | 0.2 | 0.2 |
| NX (n) | 1 | 20 | 16 | - | - | 144 | 17 | 127 | 138 | 4 | - | - | 126 | 593 | 593 |
| (%) | 1.5 | 5.1 | 4.3 | - | - | 26.5 | 4.3 | 34.2 | 6.6 | 0.5 | - | - | 18.0 | 8.6 | 10.4 |
| Unknown (n) | 56 | 355 | 331 | 83 | 378 | 72 | 315 | - | 1,227 | 603 | 560 | 199 | 1 | 4,180 | 2,960 |
| (%) | 82.4 | 90.8 | 89.2 | 100.0 | 100.0 | 13.3 | 80.0 | - | 58.3 | 81.8 | 100.0 | 100.0 | 0.1 | 60.6 | 52.1 |

(%) column percentage Pearson chi2(60) = 3.7e+03 , p<0.0001 EMH chi2(48) = 3.6e+03, p<0.00001 (collapsed categories: N2 and N3 )

[1] registration units with records only, i.e. units d, e, k and l excluded

Table 67: Urinary bladder cancer: distribution of cM-codes (TNM) by registration unit (n=6,902)

| cM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| M0 (n) | 10 | 13 | 55 | - | - | 353 | 69 | 360 | 904 | 117 | - | - | 548 | 2,429 | 2,429 |
| (%) | 14.7 | 3.3 | 14.8 | - | - | 65.0 | 17.5 | 97.0 | 42.9 | 15.9 | - | - | 78.2 | 35.2 | 42.7 |
| M1 (n) | 1 | 2 | 9 | - | - | 21 | 10 | 5 | 27 | 13 | - | - | 25 | 113 | 113 |
| (%) | 1.5 | 0.5 | 2.4 | - | - | 3.9 | 2.5 | 1.4 | 1.3 | 1.8 | - | - | 3.6 | 1.6 | 2.0 |
| M1b (n) | - | - | - | - | - | 1 | - | - | - | - | - | - | - | 1 | 1 |
| (%) | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | 0.0 | 0.0 |
| MX (n) | 3 | 21 | 25 | - | - | 152 | - | 6 | 82 | 4 | - | - | 128 | 421 | 421 |
| (%) | 4.4 | 5.4 | 6.7 | - | - | 28.0 | - | 1.6 | 3.9 | 0.5 | - | - | 18.3 | 6.1 | 7.4 |
| Unknown (n) | 54 | 355 | 282 | 83 | 378 | 16 | 315 | - | 1,093 | 603 | 560 | 199 | - | 3,938 | 2,718 |
| (%) | 79.4 | 90.8 | 76.0 | 100.0 | 100.0 | 3.0 | 80.0 | - | 51.9 | 81.8 | 100.0 | 100.0 | - | 57.1 | 47.8 |

(%) column percentage Pearson chi2(48) = 4.0e+03, p<0.0001 EMH chi2(36) = 3.9e+03, p<0.00001 (collapsed to main categories )

[1] registration units with records only, i.e. units d, e, k and l excluded

Table 68: Urinary bladder cancer: distribution of pT-codes (TNM) by registration unit (n=6,902)

| pT-code | | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[2] |
| Total (n) | | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| T0 (n) | | 1 | - | - | - | - | 2 | 1 | - | - | 2 | - | - | 5 | 11 | 11 |
| (%) | | 1.5 | - | - | - | - | 0.4 | 0.3 | - | - | 0.3 | - | - | 0.7 | 0.2 | 0.2 |
| **T1- (n)** | | **35** | **9** | **68** | **-** | **-** | **98** | **35** | **87** | **483** | **64** | **-** | **-** | **75** | **954** | **954** |
| **(%)** | | **51.5** | **2.3** | **18.3** | **-** | **-** | **18.0** | **8.9** | **23.5** | **22.9** | **8.7** | **-** | **-** | **10.7** | **13.8** | **16.8** |
| | T1 (%)[1] | 100.0 | 77.8 | 89.7 | - | - | 99.0 | 100.0 | 100.0 | 97.9 | 98.4 | - | - | 74.7 | 95.8 | |
| | T1a (%)[1] | - | 22.2 | 5.9 | - | - | 1.0 | - | - | 1.9 | 1.6 | - | - | 17.3 | 3.1 | |
| | T1b (%)[1] | - | - | 1.5 | - | - | - | - | - | 0.2 | - | - | - | 4.0 | 0.5 | |
| | T1c (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 4.0 | 0.3 | |
| | T1mic (%)[1] | - | - | 2.9 | - | - | - | - | - | - | - | - | - | - | 0.2 | |
| **T2- (n)** | | **9** | **10** | **39** | **-** | **-** | **77** | **30** | **57** | **233** | **23** | **-** | **-** | **40** | **518** | **518** |
| **(%)** | | **13.2** | **2.6** | **10.5** | **-** | **-** | **14.2** | **7.6** | **15.4** | **11.1** | **3.1** | **-** | **-** | **5.7** | **7.5** | **9.1** |
| | T2 (%)[1] | 66.7 | 40.0 | 59.0 | - | - | 44.2 | 46.7 | 63.2 | 52.8 | 65.2 | - | - | 37.5 | 52.1 | |
| | T2a (%)[1] | 33.3 | 40.0 | 33.3 | - | - | 41.6 | 43.3 | 28.1 | 38.2 | 26.1 | - | - | 35.0 | 36.7 | |
| | T2b (%)[1] | - | 10.0 | 7.7 | - | - | 14.3 | 10.0 | 8.8 | 9.0 | 8.7 | - | - | 27.5 | 11.0 | |
| | T2c (%)[1] | - | 10.0 | - | - | - | - | - | - | - | - | - | - | - | 0.2 | |
| **T3- (n)** | | **4** | **2** | **19** | **-** | **-** | **27** | **6** | **19** | **100** | **18** | **-** | **-** | **30** | **225** | **225** |
| **(%)** | | **5.9** | **0.5** | **5.1** | **-** | **-** | **5.0** | **1.5** | **5.1** | **4.7** | **2.4** | **-** | **-** | **4.3** | **3.3** | **4.0** |
| | T3 (%)[1] | - | - | 10.5 | - | - | - | - | 5.3 | 14.0 | 5.6 | - | - | 10.0 | 9.3 | |
| | T3a (%)[1] | 25.0 | 100.0 | 52.6 | - | - | 59.3 | 83.3 | 21.1 | 36.0 | 44.4 | - | - | 50.0 | 43.1 | |
| | T3b (%)[1] | 75.0 | - | 36.8 | - | - | 40.7 | 16.7 | 73.7 | 50.0 | 50.0 | - | - | 40.0 | 47.6 | |
| **T4- (n)** | | **1** | **-** | **9** | **-** | **-** | **10** | **2** | **7** | **21** | **6** | **-** | **-** | **4** | **60** | **60** |
| **(%)** | | **1.5** | **-** | **2.4** | **-** | **-** | **1.8** | **0.5** | **1.9** | **1.0** | **0.8** | **-** | **-** | **0.6** | **0.9** | **1.1** |
| | T4 (%)[1] | - | - | 22.2 | - | - | - | - | 42.9 | 14.3 | 16.7 | - | - | 25.0 | 16.7 | |
| | T4a (%)[1] | 100.0 | - | 77.8 | - | - | 90.0 | 100.0 | 57.1 | 71.4 | 66.7 | - | - | 75.0 | 75.0 | |
| | T4b (%)[1] | - | - | - | - | - | 10.0 | - | - | 14.3 | 16.7 | - | - | - | 8.3 | |
| TX (n) | | - | 8 | - | - | - | - | - | 16 | 16 | 1 | - | - | 168 | 209 | 209 |
| (%) | | - | 2.1 | - | - | - | - | - | 4.3 | 0.8 | 0.1 | - | - | 24.0 | 3.0 | 3.7 |
| Ta (n) | | 1 | 23 | 200 | - | - | 262 | 1 | 172 | 1,085 | 6 | - | - | 353 | 2,103 | 2,103 |
| (%) | | 1.5 | 5.9 | 53.9 | - | - | 48.3 | 0.3 | 46.4 | 51.5 | 0.8 | - | - | 50.4 | 30.5 | 37.0 |
| Tis (n) | | - | 6 | 13 | - | - | 33 | - | 13 | 53 | - | - | - | 25 | 143 | 143 |
| (%) | | - | 1.5 | 3.5 | - | - | 6.1 | - | 3.5 | 2.5 | - | - | - | 3.6 | 2.1 | 2.5 |
| Unknown (n) | | 17 | 333 | 23 | 83 | 378 | 34 | 319 | - | 115 | 617 | 560 | 199 | 1 | 2,679 | 1,459 |
| (%) | | 25.0 | 85.2 | 6.2 | 100.0 | 100.0 | 6.3 | 81.0 | - | 5.5 | 83.7 | 100.0 | 100.0 | 0.1 | 38.8 | 25.7 |

(%) column percentage of total n

(%)[1] column percentage per n of pT-code (T1-T4)

[2] registration units with records only, i.e. units d, e, k and l excluded

Pearson chi2(96) = 6.7e+03, p<0.0001

EMH chi2(84) = 5.1e+03, p<0.00001 (collapsed categories: T0 and unknown)

Table 69: Urinary bladder cancer: distribution of pN-codes (TNM) by registration unit (n=6,902)

| pN-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| N0 (n) | 45 | 8 | 47 | - | - | 46 | 13 | 213 | 123 | 16 | - | - | 41 | 552 | 552 |
| (%) | 66.2 | 2.1 | 12.7 | - | - | 8.5 | 3.3 | 57.4 | 5.8 | 2.2 | - | - | 5.9 | 8.0 | 9.7 |
| N1 (n) | 1 | - | 6 | - | - | 7 | 1 | 4 | 28 | 5 | - | - | 11 | 63 | 63 |
| (%) | 1.5 | - | 1.6 | - | - | 1.3 | 0.3 | 1.1 | 1.3 | 0.7 | - | - | 1.6 | 0.9 | 1.1 |
| N2 (n) | 1 | 1 | 5 | - | - | 9 | 3 | 6 | 35 | 3 | - | - | 5 | 68 | 68 |
| (%) | 1.5 | 0.3 | 1.4 | - | - | 1.7 | 0.8 | 1.6 | 1.7 | 0.4 | - | - | 0.7 | 1.0 | 1.2 |
| N3 (n) | - | - | - | - | - | 2 | - | - | 5 | 1 | - | - | - | 8 | 8 |
| (%) | - | - | - | - | - | 0.4 | - | - | 0.2 | 0.1 | - | - | - | 0.1 | 0.1 |
| NX (n) | 3 | 36 | 73 | - | - | - | - | 148 | 4 | - | - | - | 643 | 907 | 907 |
| (%) | 4.4 | 9.2 | 19.7 | - | - | - | - | 39.9 | 0.2 | - | - | - | 91.7 | 13.1 | 16.0 |
| Unknown (n) | 18 | 346 | 240 | 83 | 378 | 479 | 377 | - | 1,911 | 712 | 560 | 199 | 1 | 5,304 | 4,084 |
| (%) | 26.5 | 88.5 | 64.7 | 100.0 | 100.0 | 88.2 | 95.7 | - | 90.7 | 96.6 | 100.0 | 100.0 | 0.1 | 76.9 | 71.9 |

(%) column percentage Pearson chi2(60) = 6.9e+03, p<0.0001 EMH chi2(60) = 4.4e+03, p<0.00001

[1] registration units with records only, i.e. units d, e, k and l excluded

Table 70: Urinary bladder cancer: distribution of pM-codes (TNM) by registration unit (n=6,902)

| pM-code | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 | 5,682 |
| M0 (n) | 46 | 1 | - | - | - | - | - | 189 | 2 | - | - | - | 2 | 240 | 240 |
| (%) | 67.7 | 0.3 | - | - | - | - | - | 50.9 | 0.1 | - | - | - | 0.3 | 3.5 | 4.2 |
| M1 (n) | 2 | - | 4 | - | - | 4 | - | 6 | 8 | 3 | - | - | 8 | 35 | 35 |
| (%) | 2.9 | - | 1.1 | - | - | 0.7 | - | 1.6 | 0.4 | 0.4 | - | - | 1.1 | 0.5 | 0.6 |
| MX (n) | 2 | 43 | 92 | - | - | - | - | 176 | 1 | - | - | - | 691 | 1,005 | 1,005 |
| (%) | 2.9 | 11.0 | 24.8 | - | - | - | - | 47.4 | 0.1 | - | - | - | 98.6 | 14.6 | 17.7 |
| Unknown (n) | 18 | 347 | 275 | 83 | 378 | 539 | 394 | - | 2,095 | 734 | 560 | 199 | - | 5,622 | 4,402 |
| (%) | 26.5 | 88.8 | 74.1 | 100.0 | 100.0 | 99.3 | 100.0 | - | 99.5 | 99.6 | 100.0 | 100.0 | - | 81.5 | 77.5 |

(%) column percentage Pearson chi2(36) = 9.0e+03 , p<0.0001 EMH chi2(36) = 5.2e+03, p<0.00001

[1] registration units with records only, i.e. units d, e, k and l excluded

### 3.5.3 Date of diagnosis and treatment data

The distribution of date of urinary bladder cancer diagnosis differed moderately between the registries (table 71). The second quarter of the year was the most frequently recorded (26%), followed by the first and the fourth (25% both), and the third quarter (24%). The observed seasonal variation was statistically non-significant (p=0.291), also when controlling for sex, age and year of diagnosis (p=0.3073). Assignments of the months June, April and November as the date of first event varied the most between registries (6-13%, 4-10%, 7-13%, respectively). The observed differences were statistically non-significant (p=0.276), also when controlling for the covariates (p=0.3832). Stratified cross-tabulations for each covariate separately also led to statistically non-significant results.

Table 71: Urinary bladder cancer: distribution of date of diagnosis by registration unit (n=6,902)

| Date of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| ***1st quarter (%)*** | ***27.9*** | ***26.6*** | ***23.2*** | ***27.7*** | ***21.4*** | ***25.8*** | ***24.6*** | ***22.4*** | ***26.1*** | ***28.5*** | ***26.1*** | ***22.1*** | ***24.7*** | ***25.4*** |
| January (%) | 8.8 | 7.4 | 8.9 | 8.4 | 6.4 | 9.2 | 9.1 | 7.3 | 8.2 | 7.7 | 7.3 | 4.5 | 8.0 | 7.9 |
| February (%) | 8.8 | 9.0 | 6.2 | 10.8 | 8.2 | 9.0 | 9.1 | 7.8 | 9.0 | 11.3 | 8.9 | 8.0 | 8.1 | 8.9 |
| March (%) | 10.3 | 10.2 | 8.1 | 8.4 | 6.9 | 7.6 | 6.4 | 7.3 | 8.9 | 9.5 | 9.8 | 9.6 | 8.6 | 8.6 |
| ***2nd quarter (%)*** | ***20.6*** | ***26.1*** | ***25.9*** | ***24.1*** | ***24.9*** | ***28.6*** | ***24.9*** | ***29.7*** | ***23.2*** | ***24.6*** | ***28.0*** | ***29.7*** | ***26.5*** | ***25.5*** |
| April (%) | 7.4 | 9.0 | 7.6 | 3.6 | 10.1 | 8.3 | 8.6 | 10.2 | 7.4 | 9.1 | 9.3 | 8.0 | 8.8 | 8.4 |
| Mai (%) | 7.4 | 9.7 | 8.6 | 7.2 | 7.7 | 7.9 | 6.1 | 6.5 | 8.4 | 7.6 | 8.8 | 12.1 | 10.3 | 8.4 |
| June (%) | 5.9 | 7.4 | 9.7 | 13.3 | 7.1 | 12.3 | 10.2 | 12.9 | 7.4 | 7.9 | 10.0 | 9.6 | 7.4 | 8.7 |
| ***3rd quarter (%)*** | ***22.1*** | ***25.3*** | ***26.4*** | ***20.5*** | ***27.3*** | ***21.0*** | ***27.4*** | ***24.0*** | ***23.7*** | ***23.2*** | ***23.6*** | ***21.1*** | ***23.3*** | ***23.9*** |
| July (%) | 5.9 | 9.2 | 10.2 | 7.2 | 9.5 | 5.9 | 8.9 | 7.3 | 8.9 | 9.0 | 8.8 | 6.0 | 9.7 | 8.7 |
| August (%) | 5.9 | 7.7 | 7.0 | 6.0 | 7.9 | 6.5 | 8.4 | 7.8 | 7.2 | 9.0 | 8.4 | 7.0 | 6.4 | 7.5 |
| September (%) | 10.3 | 8.4 | 9.2 | 7.2 | 9.8 | 8.7 | 10.2 | 8.9 | 7.6 | 5.3 | 6.4 | 8.0 | 7.1 | 7.8 |
| ***4th quarter (%)*** | ***29.4*** | ***22.0*** | ***24.5*** | ***27.7*** | ***26.5*** | ***24.7*** | ***23.1*** | ***24.0*** | ***27.0*** | ***23.7*** | ***22.3*** | ***27.1*** | ***25.5*** | ***25.2*** |
| October (%) | 5.9 | 5.4 | 6.2 | 7.2 | 9.5 | 9.0 | 5.6 | 10.0 | 9.0 | 8.1 | 7.1 | 6.5 | 8.1 | 8.1 |
| November (%) | 13.2 | 10.5 | 11.1 | 8.4 | 8.7 | 7.7 | 9.1 | 7.0 | 9.3 | 8.3 | 8.0 | 11.1 | 10.1 | 9.1 |
| December (%) | 10.3 | 6.1 | 7.3 | 12.1 | 8.2 | 7.9 | 8.4 | 7.0 | 8.7 | 7.3 | 7.1 | 9.6 | 7.3 | 8.0 |

(%) column percentage

| | | |
|---|---|---|
| Quarters: | Pearson chi2(36) = 40.17, p=0.291 | EMH chi2(36) = 39.73, p=0.3073 |
| Months: | Pearson chi2(132) = 41.19, p=0.276 | EMH chi2(132) = 136.20, p=0.3832 |

Information on patient treatment represented level 2 data, which meant that the registries could, at their discretion, transmit such information to NICER. **Units a**, **d**, **e**, **h**, **k** and **l** did not provide any treatment data. (Units d, e, k and l did not also provide information on mode of detection, histological grade and TNM stage; additionally unit h on mode of detection). Treatment data were provided by seven registration units (registries b, c, f, g, i, j and m) and for 26% of all urinary bladder cancer diagnoses (table 72). The average treatment number per diagnosis ranged from 0.02 to 1.4 between the registries, with 0.3 treatments overall. Three units had treatment information for almost all of their diagnoses (93-97%). The remaining proportions of treatment information varied extremely (1-20%; p<0.0001). Among all registries, which provided treatment data, information was limited to the first treatment in 21% of all cases, to two treatments in 4%, to three treatments in 1% and to four and five treatments in <1%. **Unit g** had information up to the fifth treatment of patients, **units c and f** up to the fourth treatment, **units b, i and j** up to the third treatment and **unit m** only on the first treatment. The findings remained statistically significant when controlling for sex, age and year of diagnosis (p<0.0001).

Table 72: Urinary bladder cancer: distribution of treatment data by registration unit (n=6,902)

| Treatment | Registation unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 68 | 391 | 371 | 83 | 378 | 543 | 394 | 371 | 2,106 | 737 | 560 | 199 | 701 | 6,902 |
| No treatment data (n) | 68 | 346 | 12 | 83 | 378 | 18 | 316 | 371 | 2,083 | 610 | 560 | 199 | 52 | 5,096 |
| (%) | 100.0 | 88.5 | 3.2 | 100.0 | 100.0 | 3.3 | 80.2 | 100.0 | 98.9 | 82.8 | 100.0 | 100.0 | 7.4 | 73.8 |
| Treatment data (n) | - | 45 | 359 | - | - | 525 | 78 | - | 23 | 127 | - | - | 649 | 1,806 |
| (%) | - | 11.5 | 96.8 | - | - | 96.7 | 19.8 | - | 1.1 | 17.2 | - | - | 92.6 | 26.2 |
| Average treatment number per case | | 0.2 | 1.4 | | | 1.2 | 0.4 | | 0.02 | 0.3 | | | 0.9 | 0.3 |
| ***1st treatment (n)*** | ***-*** | ***28*** | ***237*** | ***-*** | ***-*** | ***417*** | ***26*** | ***-*** | ***18*** | ***53*** | ***-*** | ***-*** | ***649*** | ***1,428*** |
| ***(%)*** | ***-*** | ***7.2*** | ***63.9*** | ***-*** | ***-*** | ***76.8*** | ***6.6*** | ***-*** | ***0.9*** | ***7.2*** | ***-*** | ***-*** | ***92.6*** | ***20.7*** |
| ***2nd treatment (n)*** | ***-*** | ***11*** | ***97*** | ***-*** | ***-*** | ***94*** | ***29*** | ***-*** | ***4*** | ***66*** | ***-*** | ***-*** | ***-*** | ***301*** |
| ***(%)*** | ***-*** | ***2.8*** | ***26.2*** | ***-*** | ***-*** | ***17.3*** | ***7.4*** | ***-*** | ***0.2*** | ***9.0*** | ***-*** | ***-*** | ***-*** | ***4.4*** |
| ***3rd treatment (n)*** | ***-*** | ***6*** | ***21*** | ***-*** | ***-*** | ***13*** | ***17*** | ***-*** | ***1*** | ***8*** | ***-*** | ***-*** | ***-*** | ***66*** |
| ***(%)*** | ***-*** | ***1.5*** | ***5.7*** | ***-*** | ***-*** | ***2.4*** | ***4.3*** | ***-*** | ***0.1*** | ***1.1*** | ***-*** | ***-*** | ***-*** | ***1.0*** |
| ***4th treatment (n)*** | ***-*** | ***-*** | ***4*** | ***-*** | ***-*** | ***1*** | ***4*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***9*** |
| ***(%)*** | ***-*** | ***-*** | ***1.1*** | ***-*** | ***-*** | ***0.2*** | ***1.0*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.1*** |
| ***5th treatment (n)*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***2*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***2*** |
| ***(%)*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.5*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.0*** |

(%) column percentage

Pearson chi2(60) = 6.3e+03, p<0.0001 EMH chi2(48) = 6.1e+03, p<0.00001 (collapsed categories: 4th treatment and 5th treatment)

## 3.6 Haematological malignancies – outcome variables

### 3.6.1 Topography, morphology, mode of detection and basis of diagnosis

The ICD-O-3 ***topography codes*** for haematological malignancies (n=10,399) differed negligibly between the sexes (p=0.190). Leukaemias were registered in 51% of all cases, nodal lymphomas in 31% and extra-nodal lymphomas in 18% (table 73). Registrations of nodal lymphomas decreased strongly with age, from 42% (age <55) to 25% (age 85+). The proportions of leukaemias increased strongly from 40% (age <55) to 56% (age 65-74), while remaining almost as high in the last two age groups. The age distribution of extra-nodal lymphomas varied in the narrow range of 17-20% (p<0.0001). Registrations of leukaemias rose from 49% in 2008 to 53% in 2010, before returning to 49% in 2012. Nodal lymphomas showed a very similar pattern but for decline (34% in 2008, 29% in 2010 and 32% in 2012). Extra-nodal lymphomas varied inconsistently with age and in the narrow range of 15-19% (p=0.002). The proportions of nodal lymphomas ranged widely between the registries (19-45%), also that of leukaemias (41-60%) and that of extra-nodal lymphomas (11-25%; p<0.0001). The proportions of codes remained statistically significantly different when controlling for sex, age and year of diagnosis (p<0.00001).

The ICD-O-3 ***morphology codes*** hardly varied by sex (p=0.010). Hodgkin lymphomas were more common among younger (22% in the group <55) than among older patients (3.9-1.7% in patients aged 55 or older). Plasmacytomas were more common among older (e.g. 20% in the 75-84 age group) than among younger patients (8% in patients aged <55). Non-Hodgkin lymphomas (NHL) were more frequently recorded in the three middle age groups (44-48%) than in the lowest (37%) and highest age group (41%). Leukaemias showed an opposite pattern and were primarily recorded in the lowest and highest age group (30% both), followed by the middle age groups (26-29%). Non-specific coding of lymphomas, denoted as 'malignant lymphoma, NOS', increased steadily from 1% (age <55) to 8% (age 85+) with age (p<0.0001). All morphology codes differed inconsistently and less than 6% by year of diagnosis (p<0.0001). The registration units (table 74) recorded most frequently NHL (43%) and second most frequently leukaemias (29%), followed by plasmacytomas (16%) and Hodgkin lymphomas (7%). The proportions of NHL,

plasmacytomas and leukaemias varied the most between the registries (34-55%, 12-28% and 24-35%, respectively) and that of Hodgkin lymphomas moderately (4-11%). The proportion of non-specific coding of lymphomas was low (3%) but ranged from 0.6% in **unit h** to 7% in **unit c** ($p<0.0001$). These results remained statistically significant when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.00001$). The detection mode of haematological malignancies by morphology codes was primarily unknown 69% (66-79%). They were second most frequently detected following symptoms by the patient 23% (12-35%) and third most frequently incidentally 6% (3-10%), while incidental findings were the highest with leukaemias ($\chi^2(28) = 282.52$; $p<0.0001$).

The ***method of first detection of tumour*** represented level 2 information. To provide NICER with such information was not mandatory. **Units d, g, h, j, k and l** did not transmit possible data on the detection mode to NICER. Therefore, their diagnoses were excluded from the analyses of the distribution of codes ***by registration unit***. **Unit e** was also excluded from analyses, since this registry had a substantial amount of missing records for mode of detection (only 6 diagnoses coded, whereof 4 assigned code 900 'unknown' and 2 assigned code 100 'symptoms'). The codes hardly varied by sex ($p=0.052$). Symptomatically detected haematological malignancies decreased from 29% (age <55) to 21 % (age 85+) with age. In contrast, the proportion of incidental findings doubled to 8% in the highest age group and that of other methods of detection multiplied tenfold to 2%. The proportion of unknown mode of detection varied inconsistently with age ($p<0.0001$). Records of symptomatically detected haematological malignancies rose sharply from 14% to 37% during 2009-12. The proportion of incidental findings also increased with years, although only slightly. In contrast, records of unknown mode of detection decreased strongly from 80% to 55% during in 2008-12 ($p<0.0001$). These results indicate an improvement in coding of the detection method during the observation period. The registration units (table 75) most frequently recorded 'tumour symptoms' (44%) and 'unknown mode of detection' (43%), both with a wide range between the registries (6-82% and 5-89%, respectively), while **unit c** coded non-specific the least **unit b** the most. Records of 'incidental finding' were the second most frequently (11%) and also varied considerably between the registries (4-35%; $p<0.0001$). The proportions of the codes remained statistically significantly different when controlling for sex, age, year of diagnosis and *mode of detection* ($p<0.00001$).

The ***basis of diagnosis codes*** differed marginally by sex, with 87% of males and 86% of females in the category 'histology of primary tumour' ($p=0.197$). Records of 'histology of primary tumour' fell steadily from 96% (age <55) to 65% (age 85+) with age. In contrast, the proportion of the categories 'cytology' and DCO increased with age ($p<0.0001$). All basis of diagnosis codes differed only slightly by year of diagnosis ($p<0.0001$). All cancer registries had well differentiated records of the microscopic proportion (cytology, histology of metastasis and histology of primary tumour), since it represents an international quality criterion (table 76). Therefore, the proportion of non-specific coding of basis of diagnosis was extremely low (0.1%). It is noteworthy that the category 'cytology' was the second most frequently recorded (11%; $p<0.0001$). These results remained statistically significant when controlling for sex, age, and year of diagnosis ($p<0.00001$).

Table 73: Haematological malignancies: distribution of ICD-O-3 topography codes by registration unit (n=10,399)

| Topography code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| Extra-nodal lymphomas (n) | 17 | 57 | 103 | 19 | 211 | 147 | 92 | 106 | 452 | 183 | 216 | 44 | 173 | 1,820 |
| (%) | 19.5 | 11.4 | 20.4 | 13.9 | 25.3 | 21.2 | 18.5 | 21.2 | 15.7 | 17.6 | 16.4 | 12.6 | 16.5 | 17.5 |
| Nodal lymphomas (n) | 34 | 191 | 134 | 38 | 182 | 129 | 144 | 159 | 979 | 292 | 509 | 157 | 318 | 3,266 |
| (%) | 39.1 | 38.1 | 26.5 | 27.7 | 21.8 | 18.6 | 28.9 | 31.7 | 33.9 | 28.0 | 38.7 | 44.9 | 30.3 | 31.4 |
| Hematopoietic and reticulo- (n) | 36 | 253 | 269 | 80 | 442 | 416 | 262 | 236 | 1,456 | 568 | 589 | 149 | 557 | 5,313 |
| endothelial system (%) | 41.4 | 50.5 | 53.2 | 58.4 | 52.9 | 60.1 | 52.6 | 47.1 | 50.4 | 54.5 | 44.8 | 42.6 | 53.2 | 51.1 |
| (%) column percentage | Pearson chi2(24) = 227.46, p<0.0001 | | | | | | | EMH chi2(24) = 231.45, p<0.00001 | | | | | | |

Table 74: Haematological malignancies: distribution of ICD-O-3 morphology codes by registration unit (n=10,399)

| Morphology code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| Malignant lymphoma, NOS (n) | 2 | 28 | 35 | 3 | 23 | 29 | 16 | 3 | 54 | 37 | 33 | 15 | 20 | 298 |
| (%) | 2.3 | 5.6 | 6.9 | 2.2 | 2.8 | 4.2 | 3.2 | 0.6 | 1.9 | 3.6 | 2.5 | 4.3 | 1.9 | 2.9 |
| Hodgkin lymphoma (n) | 6 | 45 | 45 | 7 | 48 | 45 | 42 | 22 | 218 | 88 | 95 | 38 | 73 | 772 |
| (%) | 6.9 | 9.0 | 8.9 | 5.1 | 5.8 | 6.5 | 8.4 | 4.4 | 7.6 | 8.4 | 7.2 | 10.9 | 7.0 | 7.4 |
| Non-Hodgkin lymphoma (n) | 40 | 192 | 194 | 47 | 369 | 255 | 187 | 274 | 1,247 | 415 | 601 | 150 | 452 | 4,423 |
| (%) | 46.0 | 38.3 | 38.3 | 34.3 | 44.2 | 36.9 | 37.6 | 54.7 | 43.2 | 39.8 | 45.7 | 42.9 | 43.1 | 42.5 |
| Plasmacytoma (n) | 11 | 96 | 66 | 38 | 147 | 110 | 92 | 81 | 505 | 179 | 205 | 50 | 120 | 1,700 |
| (%) | 12.6 | 19.2 | 13.0 | 27.7 | 17.6 | 15.9 | 18.5 | 16.2 | 17.5 | 17.2 | 15.6 | 14.3 | 11.5 | 16.4 |
| Mastocytoma (n) | - | 3 | - | - | 5 | 5 | - | 1 | 1 | - | 5 | - | 6 | 26 |
| (%) | - | 0.6 | - | - | 0.6 | 0.7 | - | 0.2 | 0.0 | - | 0.4 | - | 0.6 | 0.3 |
| Immunoproliferative disease (n) | - | 8 | 8 | 2 | 3 | 22 | 8 | 1 | 48 | 18 | 31 | 7 | 13 | 169 |
| (%) | - | 1.6 | 1.6 | 1.5 | 0.4 | 3.2 | 1.6 | 0.2 | 1.7 | 1.7 | 2.4 | 2.0 | 1.2 | 1.6 |
| Leukemia (n) | 27 | 127 | 158 | 40 | 238 | 221 | 153 | 119 | 808 | 306 | 337 | 87 | 364 | 2,985 |
| (%) | 31.0 | 25.4 | 31.2 | 29.2 | 28.5 | 31.9 | 30.7 | 23.8 | 28.0 | 29.3 | 25.7 | 24.9 | 34.7 | 28.7 |
| Other, specified (n) | 1 | 2 | - | - | 2 | 5 | - | - | 6 | - | 7 | 3 | - | 26 |
| (%) | 1.2 | 0.4 | - | - | 0.2 | 0.7 | - | - | 0.2 | - | 0.5 | 0.9 | - | 0.3 |
| (%) column percentage | Pearson chi2(84) = 294.43, p<0.0001 | | | | | | | EMH chi2(84) = 302.13, p<0.00001 | | | | | | |

Table 75: Haematological malignancies: Method of 1st detection of tumour by registration unit (n=10,399)

| Detection | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 | 5,721 |
| Symptoms (n) | 41 | 32 | 413 | - | 2 | 373 | - | - | 1,081 | - | - | - | 571 | 2,513 | 2,513 |
| (%) | 47.1 | 6.4 | 81.6 | - | 0.2 | 53.9 | - | - | 37.4 | - | - | - | 54.5 | 24.2 | 43.9 |
| Incidental (n) | 3 | 18 | 38 | - | - | 46 | - | - | 141 | - | - | - | 369 | 615 | 615 |
| (%) | 3.5 | 3.6 | 7.5 | - | - | 6.7 | - | - | 4.9 | - | - | - | 35.2 | 5.9 | 10.7 |
| Screening (n) | 4 | 1 | 24 | - | - | 22 | - | - | 6 | - | - | - | 3 | 60 | 60 |
| (%) | 4.6 | 0.2 | 4.7 | - | - | 3.2 | - | - | 0.2 | - | - | - | 0.3 | 0.6 | 1.0 |
| Other (n) | - | 3 | 6 | - | - | 1 | - | - | 36 | - | - | - | 10 | 56 | 56 |
| (%) | - | 0.6 | 1.2 | - | - | 0.1 | - | - | 1.3 | - | - | - | 1.0 | 0.5 | 1.0 |
| Unknown (n) | 39 | 447 | 25 | 137 | 833 | 250 | 498 | 501 | 1,623 | 1,043 | 1,314 | 350 | 95 | 7,155 | 2,477 |
| (%) | 44.8 | 89.2 | 4.9 | 100.0 | 99.8 | 36.1 | 100.0 | 100.0 | 56.2 | 100.0 | 100.0 | 100.0 | 9.1 | 68.8 | 43.3 |

(%) column percentage Pearson chi2(48) = 6.6e+03, p<0.0001 EMH chi2(48) = 6.8e+03, p<0.00001

[1] Registration units with records only, i.e. units d, g, h, j, k and l excluded. Unit e is also excluded due to extremely low record.

Table 76: Haematological malignancies: distribution of basis of diagnosis codes by registration unit (n=10,399)

| Basis of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| DCO (n) | 1 | 3 | 2 | - | 5 | 1 | - | - | 78 | 1 | 21 | - | 7 | 119 |
| (%) | 1.2 | 0.6 | 0.4 | - | 0.6 | 0.1 | - | - | 2.7 | 0.1 | 1.6 | - | 0.7 | 1.1 |
| Clinical (n) | 1 | 6 | 1 | - | - | 1 | - | - | 1 | 3 | - | - | - | 13 |
| (%) | 1.2 | 1.2 | 0.2 | - | - | 0.1 | - | - | 0.0 | 0.3 | - | - | - | 0.1 |
| Clinical investigation (n) | 1 | 4 | 1 | - | 3 | 3 | 3 | 2 | 9 | 12 | - | - | 2 | 40 |
| (%) | 1.2 | 0.8 | 0.2 | - | 0.4 | 0.4 | 0.6 | 0.4 | 0.3 | 1.2 | - | - | 0.2 | 0.4 |
| Tumour markers (n) | 1 | 1 | - | - | 4 | 1 | 4 | - | 14 | 2 | - | - | 19 | 46 |
| (%) | 1.2 | 0.2 | - | - | 0.5 | 0.1 | 0.8 | - | 0.5 | 0.2 | - | - | 1.8 | 0.4 |
| Cytology (n) | - | 33 | 53 | 15 | 116 | 96 | 83 | 7 | 260 | 108 | 86 | 56 | 221 | 1,134 |
| (%) | - | 6.6 | 10.5 | 11.0 | 13.9 | 13.9 | 16.7 | 1.4 | 9.0 | 10.4 | 6.5 | 16.0 | 21.1 | 10.9 |
| Histology of metastasis (n) | 1 | 3 | 14 | - | 5 | 6 | 1 | - | - | 1 | 1 | - | - | 32 |
| (%) | 1.2 | 0.6 | 2.8 | - | 0.6 | 0.9 | 0.2 | - | - | 0.1 | 0.1 | - | - | 0.3 |
| Histology of primary tumour (n) | 82 | 448 | 435 | 122 | 701 | 584 | 406 | 492 | 2,525 | 916 | 1,193 | 294 | 799 | 8,997 |
| (%) | 94.3 | 89.4 | 86.0 | 89.1 | 84.0 | 84.4 | 81.5 | 98.2 | 87.5 | 87.8 | 90.8 | 84.0 | 76.2 | 86.5 |
| Unknown (n) | - | 3 | - | - | 1 | - | 1 | - | - | - | 13 | - | - | 18 |
| (%) | - | 0.6 | - | - | 0.1 | - | 0.2 | - | - | - | 1.0 | - | - | 0.2 |

(%) column percentage Pearson chi2(84) = 715.94, p<0.0001 EMH chi2(84) = 681.72, p<0.00001

### 3.6.2 Grade and TNM staging

Histological grade and TNM staging information corresponded to level 2 data. The cancer registries were not required to provide NICER with such information. In addition, grade information is irrelevant for most haematological malignancies.

However, five registration units (registries b, c, f, h and i) occasionally reported histological grade information (table 77). Non-specific coding of histological grade ranged from 51% in **unit h** to 99.7% in **unit f** and was the most frequently record overall (94%). **Unit h** had by far the highest proportion of Grade 1 (16%) and grade 3 records (33%; $p<0.0001$). The proportions of codes remained statistically significantly different when controlling for sex, age and year of diagnosis ($p<0.00001$). Grade 1, grade 2 and grade 3 were primarily assigned if the detection method was unknown (77%, 46% and 92%, respectively) and grade X due to tumour symptoms (57%; ($\chi^2(16) = 63.15$; $p<0.0001$). The codes hardly differed by sex ($p= 0.274$) and by age group ($p=0.019$). The proportion of non-specific coding of histological grade increased slightly from 95% in 2010 to 99% in 2011 and remained on this level. In contrast, assignments of grade 3 decreased from 3% to 0.2% (2008-2011) and that of grade 1 from 2% to 0.3% (2008-2011; $p<0.0001$).

The ***UICC does not propose a TNM classification for Hodgkin lymphomas and NHL***. Instead, the Ann Arbor classification, which was developed in 1971, is recommended.[39,40] There is no need for traditional TNM staging of **leukaemias**, since they start in the bone marrow and spread to other organs. Surprisingly, **registration units b, c, e, f, h, i and m** coded haematological malignancies using some clinical TNM classification (tables 78-80). **Units c, e, h, i and m** also provided information on the pathological TNM classification (tables 81-83). The findings are only briefly discussed, as TNM staging is not indicated with haematological malignancies. **Units h and m** had applied the codes the most differentiated along the two lines of TNM, especially for the T categories. **Unit h** had high proportions of clinical and pathological TX, N0 and M0 and a low proportion (or no proportion) of non-specific coding of cTNM and pTNM. **Unit m** had high proportions of non-specific coding of TNM and of codes cMX and pMX, which indicate that the primary tumour cannot be assessed. The other units coded most frequently non-specific or assigned TX, NX and MX along the two lines of TNM. The TNM proportions remained statistically significantly different when controlling for covariates sex, age and year of diagnosis ($p<0.00001$).

Table 77: Haematological malignancies: distribution of histological grading codes by registration unit (n=10,399)

| Grade | Registration unit | | | | | | | | | | | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | all | with record[1] |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 | 5,087 |
| Grade 1 (n) | - | 4 | 3 | - | - | - | - | 80 | 28 | - | - | - | - | 115 | 115 |
| (%) | - | 0.8 | 0.6 | - | - | - | - | 16.0 | 1.0 | - | - | - | - | 1.1 | 2.3 |
| Grade 2 (n) | - | 9 | 3 | - | - | 1 | - | 3 | 8 | - | - | - | - | 24 | 24 |
| (%) | - | 1.8 | 0.6 | - | - | 0.1 | - | 0.6 | 0.3 | - | - | - | - | 0.2 | 0.5 |
| Grade 3 (n) | - | - | 10 | - | - | 1 | - | 163 | 10 | - | - | - | - | 184 | 184 |
| (%) | - | - | 2.0 | - | - | 0.1 | - | 32.5 | 0.4 | - | - | - | - | 1.8 | 3.6 |
| Grade X (n) | - | 5 | 2 | - | - | - | - | - | - | - | - | - | - | 7 | 7 |
| (%) | - | 1.0 | 0.4 | - | - | - | - | - | - | - | - | - | - | 0.1 | 0.1 |
| Unknown (n) | 87 | 483 | 488 | 137 | 835 | 690 | 498 | 255 | 2,841 | 1,043 | 1,314 | 350 | 1,048 | 10,069 | 4,757 |
| (%) | 100.0 | 96.4 | 96.4 | 100.0 | 100.0 | 99.7 | 100.0 | 50.9 | 98.4 | 100.0 | 100.0 | 100.0 | 100.0 | 96.8 | 93.5 |

(%) column percentage Pearson chi2(48) = 4.2e+03, p<0.0001 EMH chi2(48) = 2.1e+03, p<0.00001

[1] registration units with records only, i.e. units a, d, e, g, j, k, l and m excluded

Table 78: Haematological malignancies: distribution of cT-codes (TNM) by registration unit (n=10,399)

| cT-code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| **T1- (n)** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **26** | **1** | **-** | **-** | **-** | **58** | **85** |
| **(%)** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **5.2** | **0.03** | **-** | **-** | **-** | **5.5** | **0.8** |
| T1 (%)[1] | - | - | - | - | - | - | - | 88.5 | 100.0 | - | - | - | 13.8 | 37.6 |
| T1a (%)[1] | - | - | - | - | - | - | - | 7.7 | - | - | - | - | 74.1 | 52.9 |
| T1b (%)[1] | - | - | - | - | - | - | - | 3.8 | - | - | - | - | 12.1 | 9.4 |
| **T2- (n)** | **-** | **-** | **1** | - | **-** | **-** | **-** | **22** | **-** | **-** | **-** | - | **62** | **85** |
| **(%)** | **-** | **-** | **0.2** | **-** | **-** | **-** | **-** | **4.4** | **-** | **-** | **-** | **-** | **5.9** | **0.8** |
| T2 (%)[1] | - | - | 100.0 | - | - | - | - | 90.9 | - | - | - | - | 6.5 | 29.4 |
| T2b (%)[1] | - | - | - | - | - | - | - | 9.1 | - | - | - | - | 72.6 | 55.3 |
| T2c (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 21.0 | 15.3 |
| **T3- (n)** | **-** | **-** | **-** | - | **-** | **-** | **-** | **21** | **-** | **-** | - | - | **83** | **104** |
| **(%)** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **4.2** | **-** | **-** | **-** | **-** | **7.9** | **1.0** |
| T3 (%)[1] | - | - | - | - | - | - | - | 81.0 | - | - | - | - | 4.8 | 20.2 |
| T3a (%)[1] | **-** | **-** | **-** | **-** | - | **-** | **-** | 14.3 | - | - | - | - | 63.9 | 53.8 |
| T3b (%)[1] | - | - | - | - | - | - | - | 4.8 | - | - | - | - | 31.3 | 26.0 |
| **T4- (n)** | **-** | **1** | **1** | **-** | **-** | **-** | **-** | **62** | **-** | **-** | - | - | **144** | **208** |
| **(%)** | **-** | **0.2** | **0.2** | **-** | **-** | **-** | **-** | **12.4** | **-** | **-** | **-** | **-** | **13.7** | **2.0** |
| T4 (%)[1] | - | - | 100.0 | - | - | - | - | 96.8 | - | - | - | - | 4.9 | 32.7 |
| T4a (%)[1] | - | 100.0 | - | - | - | - | - | 3.2 | - | - | - | - | 50.7 | 36.5 |
| T4b (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 44.4 | 30.8 |
| TX (n) | - | 1 | 1 | - | 6 | 1 | - | 363 | 2 | - | - | - | 60 | 434 |
| (%) | - | 0.2 | 0.2 | - | 0.7 | 0.1 | - | 72.5 | 0.1 | - | - | - | 5.7 | 4.2 |
| Unknown (n) | 87 | 499 | 503 | 137 | 829 | 691 | 498 | 7 | 2,884 | 1,043 | 1,314 | 350 | 641 | 9,483 |
| (%) | 100.0 | 99.6 | 99.4 | 100.0 | 99.3 | 99.9 | 100.0 | 1.4 | 99.9 | 100.0 | 100.0 | 100.0 | 61.2 | 91.2 |

(%) column percentage of total n

(%)[1] column percentage per n of CT-code (T1-T4)

Pearson chi2(156) = 1.1e+04, p<0.0001

EMH chi2(60) = 5.3e+03, p<0.00001 (collapsed to main categories)

Table 79: Haematological malignancies: distribution of cN-codes (TNM) by registration unit (n=10,399)

| cN-code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| N0 (n) | - | - | 1 | - | - | - | - | 286 | 1 | - | - | - | 5 | 293 |
| (%) | - | - | 0.2 | - | - | - | - | 57.1 | 0.0 | - | - | - | 0.5 | 2.8 |
| N1 (n) | - | 1 | 1 | - | - | 1 | - | - | - | - | - | - | 1 | 4 |
| (%) | - | 0.2 | 0.2 | - | - | 0.1 | - | - | - | - | - | - | 0.1 | 0.04 |
| N2c (n) | - | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 |
| (%) | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - | 0.01 |
| NX (n) | - | - | 1 | - | 6 | - | - | 208 | 2 | - | - | - | 215 | 432 |
| (%) | - | - | 0.2 | - | 0.7 | - | - | 41.5 | 0.1 | - | - | - | 20.5 | 4.2 |
| Unknown (n) | 87 | 499 | 503 | 137 | 829 | 691 | 498 | 7 | 2,884 | 1,043 | 1,314 | 350 | 827 | 9,669 |
| (%) | 100.0 | 99.6 | 99.4 | 100.0 | 99.3 | 99.9 | 100.0 | 1.4 | 99.9 | 100.0 | 100.0 | 100.0 | 78.9 | 93.0 |

(%) column percentage Pearson chi2(48) = 8.8e+03, p<0.0001 EMH chi2(12) = 2.1e+03, p<0.00001 (N0, N1 and N2 to category unknown collapsed)

Table 80: Haematological malignancies: distribution of cM-codes (TNM) by registration unit (n=10,399)

| cM-code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| M0 (n) | - | 2 | 5 | - | 3 | - | - | 295 | 3 | - | - | - | 7 | 315 |
| (%) | - | 0.4 | 1.0 | - | 0.4 | - | - | 58.9 | 0.1 | - | - | - | 0.7 | 3.0 |
| M1 (n) | - | - | 1 | - | 1 | - | - | - | - | - | - | - | 1 | 3 |
| (%) | - | - | 0.2 | - | 0.1 | - | - | - | - | - | - | - | 0.1 | 0.0 |
| MX (n) | - | - | - | - | 2 | 1 | - | 206 | 1 | - | - | - | 1,040 | 1,250 |
| (%) | - | - | - | - | 0.2 | 0.1 | - | 41.1 | 0.0 | - | - | - | 99.2 | 12.0 |
| Unknown (n) | 87 | 499 | 500 | 137 | 829 | 691 | 498 | - | 2,883 | 1,043 | 1,314 | 350 | - | 8,831 |
| (%) | 100.0 | 99.6 | 98.8 | 100.0 | 99.3 | 99.9 | 100.0 | - | 99.9 | 100.0 | 100.0 | 100.0 | - | 84.9 |

(%) column percentage Pearson chi2(36) = 1.5e+04 , p<0.0001 EMH chi2(24) = 7.8e+03, p<0.00001 (M1 and category unknown collapsed)

Table 81: Haematological malignancies: distribution of pT-codes (TNM) by registration unit (n=10,399)

| pT-code | | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| **T1- (n)** | | **-** | **-** | **4** | **-** | **-** | **-** | **-** | **24** | **-** | **-** | **-** | **-** | **53** | **81** |
| **(%)** | | **-** | **-** | **0.8** | **-** | **-** | **-** | **-** | **4.8** | **-** | **-** | **-** | **-** | **5.1** | **0.8** |
| | T1 (%)[1] | - | - | 75.0 | - | - | - | - | 87.5 | - | - | - | - | 9.4 | 35.8 |
| | T1a (%)[1] | - | - | 25.0 | - | - | - | - | 8.3 | - | - | - | - | 79.2 | 55.6 |
| | T1b (%)[1] | - | - | - | - | - | - | - | 4.2 | - | - | - | - | 11.3 | 8.6 |
| **T2- (n)** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **22** | **-** | **-** | **-** | **-** | **57** | **79** |
| **(%)** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **4.4** | **-** | **-** | **-** | **-** | **5.4** | **0.8** |
| | T2 (%)[1] | - | - | - | - | - | - | - | 86.4 | - | - | - | - | 3.5 | 26.6 |
| | T2a (%)[1] | - | - | - | - | - | - | - | 13.6 | - | - | - | - | 77.2 | 59.5 |
| | T2b (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 19.3 | 13.9 |
| **T3- (n)** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **21** | **-** | **-** | **-** | **-** | **83** | **104** |
| **(%)** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **4.2** | **-** | **-** | **-** | **-** | **7.9** | **1.0** |
| | T3 (%)[1] | - | - | - | - | - | - | - | 81.0 | - | - | - | - | 3.6 | 19.2 |
| | T3a (%)[1] | - | - | - | - | - | - | - | 14.3 | - | - | - | - | 62.7 | 52.9 |
| | T3b (%)[1] | - | - | - | - | - | - | - | 4.8 | - | - | - | - | 32.5 | 26.9 |
| | T3c (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 1.2 | 1.0 |
| **T4- (n)** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **84** | **-** | **-** | **-** | **-** | **139** | **223** |
| **(%)** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **16.8** | **-** | **-** | **-** | **-** | **13.3** | **2.1** |
| | T4 (%)[1] | - | - | - | - | - | - | - | 97.6 | - | - | - | - | 4.3 | 39.5 |
| | T4a (%)[1] | - | - | - | - | - | - | - | 2.4 | - | - | - | - | 51.8 | 33.2 |
| | T4b (%)[1] | - | - | - | - | - | - | - | - | - | - | - | - | 43.9 | 27.4 |
| TX (n) | | - | - | - | - | 6 | - | - | 343 | - | - | - | - | 76 | 425 |
| (%) | | - | - | - | - | 0.7 | - | - | 68.5 | - | - | - | - | 7.3 | 4.1 |
| Unknown (n) | | 87 | 501 | 502 | 137 | 829 | 692 | 498 | 7 | 2,887 | 1,043 | 1,314 | 350 | 640 | 9,487 |
| | (%) | 100.0 | 100.0 | 99.2 | 100.0 | 99.3 | 100.0 | 100.0 | 1.4 | 100.0 | 100.0 | 100.0 | 100.0 | 61.1 | 91.2 |

(%) column percentage of total n

(%)[1] column percentage per n of PT-code (T1-T4)

Pearson chi2(168) = 1.1e+04 , p<0.0001

EMH chi2(60) = 5.3e+03, p<0.00001 (collapsed to main categories)

Table 82: Haematological malignancies: distribution of pN-codes (TNM) by registration unit (n=10,399)

| pN-code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| N0 (n) | - | - | 3 | - | 1 | - | - | 286 | - | - | - | - | 1 | 291 |
| (%) | - | - | 0.59 | - | 0.12 | - | - | 57.09 | - | - | - | - | 0.1 | 2.8 |
| NX (n) | - | - | 1 | - | 5 | - | - | 208 | - | - | - | - | 221 | 435 |
| (%) | - | - | 0.2 | - | 0.6 | - | - | 41.52 | - | - | - | - | 21.09 | 4.18 |
| Unknown (n) | 87 | 501 | 502 | 137 | 829 | 692 | 498 | 7 | 2,887 | 1,043 | 1,314 | 350 | 826 | 9,673 |
| (%) | 100 | 100 | 99.21 | 100 | 99.28 | 100 | 100 | 1.4 | 100 | 100 | 100 | 100 | 78.82 | 93.02 |

(%) column percentage Pearson chi2(24) = 8.8e+03, p<0.0001 EMH chi2(24) = 4.8e+03, p<0.00001

Table 83: Haematological malignancies: distribution of pM-codes (TNM) by registration unit (n=10,399)

| pM-code | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| M0 (n) | - | - | 1 | - | - | - | - | 293 | - | - | - | - | - | 294 |
| (%) | - | - | 0.2 | - | - | - | - | 58.5 | - | - | - | - | - | 2.8 |
| M1 (n) | - | - | 1 | - | - | - | - | - | 1 | - | - | - | - | 2 |
| (%) | - | - | 0.2 | - | - | - | - | - | 0.0 | - | - | - | - | 0.0 |
| MX (n) | - | - | 1 | - | 6 | - | - | 208 | - | - | - | - | 1,048 | 1,263 |
| (%) | - | - | 0.2 | - | 0.7 | - | - | 41.5 | - | - | - | - | 100.0 | 12.2 |
| Unknown (n) | 87 | 501 | 503 | 137 | 829 | 692 | 498 | - | 2,886 | 1,043 | 1,314 | 350 | - | 8,840 |
| (%) | 100.0 | 100.0 | 99.4 | 100.0 | 99.3 | 100.0 | 100.0 | - | 100.0 | 100.0 | 100.0 | 100.0 | - | 85.0 |

(%) column percentage Pearson chi2(36) = 1.5e+04, p<0.0001 EMH chi2(24) = 7.8e+03, p<0.00001 (M1 and category unknown collapsed)

### 3.6.3 Date of diagnosis and treatment data

The distribution of date of haematological malignancy diagnosis did not substantially differ between the registries (table 84). The first and fourth quarter of the year were the most frequently recorded (26% both), followed by the second (25% both), and the third quarter (24%). The observed small seasonal variation was statistically non-significant (p=0.194), also when controlling for sex, age and year of diagnosis (p=0.2112). Assignments of the months September, November and June as the date of first event varied the most between the units (7-13%, 6-13%, 6-12%, respectively). However, the observed differences were of no statistical significance (p=0.233), also when controlling for the covariates (p=0.2719). Stratified cross-tabulations for each covariate separately also led to statistically non-significant results.

Table 84: Haematological malignancies: distribution of date of diagnosis by registration unit (n=10,399)

| Date of diagnosis | Registration unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| ***1st quarter (%)*** | ***24.1*** | ***27.5*** | ***25.7*** | ***21.9*** | ***25.5*** | ***26.3*** | ***24.7*** | ***23.8*** | ***25.6*** | ***26.0*** | ***25.6*** | ***22.0*** | ***26.5*** | ***25.6*** |
| January (%) | 8.1 | 9.0 | 9.5 | 9.5 | 8.1 | 9.7 | 7.6 | 8.8 | 9.5 | 9.6 | 9.8 | 5.1 | 9.2 | 9.1 |
| February (%) | 10.3 | 8.6 | 8.1 | 7.3 | 9.0 | 7.4 | 7.2 | 8.0 | 7.9 | 7.2 | 7.8 | 7.4 | 7.2 | 7.8 |
| March (%) | 5.8 | 10.0 | 8.1 | 5.1 | 8.4 | 9.3 | 9.8 | 7.0 | 8.3 | 9.2 | 7.9 | 9.4 | 10.2 | 8.7 |
| ***2nd quarter (%)*** | ***25.3*** | ***24.8*** | ***22.1*** | ***19.0*** | ***29.3*** | ***21.7*** | ***25.7*** | ***26.2*** | ***25.0*** | ***24.5*** | ***24.8*** | ***27.4*** | ***26.8*** | ***25.2*** |
| April (%) | 5.8 | 9.8 | 7.1 | 6.6 | 8.6 | 6.8 | 5.8 | 8.4 | 7.9 | 9.7 | 7.0 | 7.7 | 8.0 | 7.9 |
| Mai (%) | 10.3 | 7.6 | 8.7 | 5.8 | 8.7 | 7.8 | 9.0 | 9.0 | 7.6 | 5.9 | 8.3 | 10.6 | 9.6 | 8.1 |
| June (%) | 9.2 | 7.4 | 6.3 | 6.6 | 12.0 | 7.1 | 10.8 | 8.8 | 9.5 | 8.9 | 9.5 | 9.1 | 9.2 | 9.2 |
| ***3rd quarter (%)*** | ***29.9*** | ***22.4*** | ***23.3*** | ***32.9*** | ***22.2*** | ***24.0*** | ***20.7*** | ***25.6*** | ***24.3*** | ***24.6*** | ***23.8*** | ***24.0*** | ***21.5*** | ***23.7*** |
| July (%) | 11.5 | 7.6 | 8.9 | 11.0 | 8.0 | 7.1 | 6.6 | 8.6 | 8.1 | 7.9 | 8.9 | 6.9 | 7.7 | 8.1 |
| August (%) | 9.2 | 8.0 | 6.5 | 8.8 | 7.1 | 8.0 | 8.2 | 8.0 | 7.6 | 7.8 | 7.9 | 9.7 | 6.4 | 7.6 |
| September (%) | 9.2 | 6.8 | 7.9 | 13.1 | 7.1 | 9.0 | 5.8 | 9.0 | 8.6 | 9.0 | 7.0 | 7.4 | 7.4 | 8.0 |
| ***4th quarter (%)*** | ***20.7*** | ***25.4*** | ***28.9*** | ***26.3*** | ***23.0*** | ***28.0*** | ***28.9*** | ***24.6*** | ***25.2*** | ***24.8*** | ***25.8*** | ***26.6*** | ***25.2*** | ***25.6*** |
| October (%) | 8.1 | 8.6 | 9.5 | 10.2 | 8.6 | 10.0 | 10.8 | 7.2 | 8.1 | 8.9 | 8.3 | 7.7 | 8.1 | 8.6 |
| November (%) | 5.8 | 7.2 | 10.9 | 8.8 | 5.9 | 9.3 | 12.3 | 8.4 | 8.8 | 8.4 | 8.6 | 9.7 | 7.8 | 8.6 |
| December (%) | 6.9 | 9.6 | 8.5 | 7.3 | 8.5 | 8.8 | 5.8 | 9.0 | 8.2 | 7.5 | 8.9 | 9.1 | 9.3 | 8.4 |

(%) column percentage

Quarters: Pearson chi2(36) = 43.08, p=0.194 EMH chi2(36) = 42.50, p=0.2112

Months: Pearson chi2(132) = 143.52, p=0.233 EMH chi2(132) = 141.42, p= 0.2719

Information on patient treatment represented level 2 data, which meant that the registries could, at their discretion, transmit such information to NICER. In addition to **units d, g, h, j, k and l**, which did not already provide any data on mode of detection, also **units a** did not provide any treatment data (table 85). Treatment data were provided by six registration units and for 18% of all recorded haematological malignancies. The average treatment number per diagnosis ranged from <0.1 to 1.2 between the registries, with was 0.2 treatments overall. **Units c, f and m** had treatment information for the most of their diagnoses (76%, 61% and 63%, respectively), **units b and i** for 8% and 11%, respectively, and **unit e** for less than 1% (p<0.0001). Among all registries which provided treatment data, information was limited to one treatment in 14% of all cases, to two treatments in 13%, to three, four and five treatments in <1%. **Units b, c, e, f, g and j** had data up to the fifth treatment of a patient, **unit i** up to the fourth treatment and **unit m** only on the first treatment.

Table 85: Haematological malignancies: distribution of treatment data by registration unit (n=10,399)

| Treatment | Registation unit | | | | | | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m | |
| Total (n) | 87 | 501 | 506 | 137 | 835 | 692 | 498 | 501 | 2,887 | 1,043 | 1,314 | 350 | 1,048 | 10,399 |
| No treatment data (n) | 87 | 459 | 122 | 137 | 833 | 269 | 498 | 501 | 2,584 | 1,043 | 1,314 | 350 | 384 | 8,581 |
| (%) | 100.0 | 91.6 | 24.1 | 100.0 | 99.8 | 38.9 | 100.0 | 100.0 | 89.5 | 100.0 | 100.0 | 100.0 | 36.6 | 82.5 |
| Treatment data (n) | - | 42 | 384 | - | 2 | 423 | - | - | 303 | - | - | - | 664 | 1,818 |
| (%) | - | 8.4 | 75.9 | - | 0.2 | 61.1 | - | - | 10.5 | - | - | - | 63.4 | 17.5 |
| Average treatment number per case | | 0.1 | 1.2 | | 0.01 | 0.8 | | | 0.1 | | | | 0.6 | 0.2 |
| ***1st treatment (n)*** | ***-*** | ***21*** | ***217*** | ***-*** | ***1*** | ***317*** | ***-*** | ***-*** | ***200*** | ***-*** | ***-*** | ***-*** | ***664*** | ***1,420*** |
| ***(%)*** | ***-*** | ***4.2*** | ***42.9*** | ***-*** | ***0.1*** | ***45.8*** | ***-*** | ***-*** | ***6.9*** | ***-*** | ***-*** | ***-*** | ***63.4*** | ***13.7*** |
| ***2nd treatment (n)*** | ***-*** | ***14*** | ***112*** | ***-*** | ***-*** | ***93*** | ***-*** | ***-*** | ***84*** | ***-*** | ***-*** | ***-*** | ***-*** | ***303*** |
| ***(%)*** | ***-*** | ***2.8*** | ***22.1*** | ***-*** | ***-*** | ***13.4*** | ***-*** | ***-*** | ***2.9*** | ***-*** | ***-*** | ***-*** | ***-*** | ***2.9*** |
| ***3rd treatment (n)*** | ***-*** | ***6*** | ***36*** | ***-*** | ***1*** | ***12*** | ***-*** | ***-*** | ***12*** | ***-*** | ***-*** | ***-*** | ***-*** | ***67*** |
| ***(%)*** | ***-*** | ***1.2*** | ***7.1*** | ***-*** | ***0.1*** | ***1.7*** | ***-*** | ***-*** | ***0.4*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.6*** |
| ***4th treatment (n)*** | ***-*** | ***1*** | ***13*** | ***-*** | ***-*** | ***1*** | ***-*** | ***-*** | ***6*** | ***-*** | ***-*** | ***-*** | ***-*** | ***21*** |
| ***(%)*** | ***-*** | ***0.2*** | ***2.6*** | ***-*** | ***-*** | ***0.1*** | ***-*** | ***-*** | ***0.2*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.2*** |
| ***5th treatment (n)*** | ***-*** | ***-*** | ***6*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***1*** | ***-*** | ***-*** | ***-*** | ***-*** | ***7*** |
| ***(%)*** | ***-*** | ***-*** | ***1.2*** | ***-*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.0*** | ***-*** | ***-*** | ***-*** | ***-*** | ***0.1*** |

(%) column percentage Pearson chi2(60) = 2.6e+04 , p<0.0001 EMH chi2(60) = 2.3e+04, p<0.00001

# 4 Discussion

The master thesis entitled 'Coding Patterns in Swiss Cantonal Cancer Registries (COPRA)' has been conducted based on an anonymised sample (71,679 diagnoses) of all colorectal (13,738), breast (20,804), prostate (19,836) and urinary bladder cancer diagnoses (6,902) and that of haematological malignancies (10,399) during 2008-12, which were extracted from the database of the National Institute for Cancer Epidemiology and Registration (NICER) as at March 2015. These cancers have been chosen because of their high incidence (breast, prostate and colorectal cancer accounted for ~40% of all cancers worldwide in 2012) or known coding problems (urinary bladder and haematological system).[18,25,44] The observation period represents the most up-to-date data basis for a systematic retrospective assessment of the coding patterns of thirteen Swiss cancer registration units (a-m). The findings cover analyses of coding patterns for the variables ***topography*** (level 1), ***morphology*** (level 1), ***basis of diagnosis*** (level 1), ***first method of tumour detection*** (level 2), ***histological grade*** (level 2), ***TNM stage*** (level 2), ***date of diagnosis*** (level 1) ***and treatment data*** (level 2). Up to 2015, the NICER core dataset comprised registration data on two levels. Level 1 data are provided by all registries to enable nationwide basic incidence statistics. Level 2 data, which enable survival analysis and in-depth incidence statistics, were only provided by a subset of registries and mandatory for breast and colorectal cancer only, and recommended only for other tumour sites.[17,27,28] For these eight outcome variables, coding patterns of the thirteen cancer registration units were examined using contingency tables and chi-square statistics, while controlling for sex, age, year of diagnosis and, if applicable, for screening and mode of detection.

***Results of the analyses by age of patients at diagnosis*** reveal that cases of patients aged 85+ are rather non-specifically coded. This age gradient in coding of the variables topography, morphology, histological grade and detection method is observed for the sites colorectal (except topography), breast, prostate (except topography) and urinary bladder. An age gradient in coding of the variable morphology is also evident for non-specific assignments of lymphomas, denoted as 'malignant lymphoma, NOS'. It should be noted that prostate cancer diagnoses are in general assigned code C61.9 (the ICD-O-3 topography code for prostate gland) and that the code C20.9 'rectum, NOS' is the only topographical code for rectal carcinoma and therefore cannot be considered as non-specific coding. In addition, code C20.9 'rectum, NOS' is the most frequently assigned of all topographical codes for colorectal cancer. Also assignments of the clinical and pathological TX, NX and MX codes became more common with increasing age of patients. As a result, tumour-node-metastasis information could not be assessed mainly in patients aged 85+. The age gradient in non-specific coding of the variable detection method is more pronounced for breast and prostate cancer than for colorectal and urinary bladder cancer, since the two first-mentioned cancers have a higher proportion of diagnoses which were detected by screening methods. Screening methods are usually offered to people of a certain age group and in the case of mammography programmes in Switzerland to women between 50 and 70 years.[34] In this respect, it should be noted that the category 'screening' includes all examinations in symptom-free individuals (code 300: check-up/screening, opportunistic and systematic screening), as the detailed site-specific screening codes were combined into one screening category per site. However, two additional categories are listed for breast cancer analyses: mammography as opportunistic screening and mammography as systematic screening (within a screening programme). An age gradient in non-specific coding of the variable basis of diagnosis is not observed. This results from the fact that the microscopic proportion (cytology, histology of metastasis and histology of primary tumour) represents an international quality criterion. In consequence, proportions of non-specific coding

of basis of diagnosis are extremely low for all tumour sites. However, a decrease in coding of the category 'histology of primary tumour', which is the most common assignment for all tumour sites (87-98%), is observed with increasing age of patients. Assignments of the non-microscopic proportion (Death Certificate Only (DCO), clinical, clinical investigation and tumour markers) are more common among patients aged 85+ (1.1-8.0%). One explanation for the observed high proportion of tumour markers as code for basis of diagnosis of prostate cancer (14% compared with 0.1-2.0% in remaining sites) could be that testing for prostate-specific antigen (PSA), however controversially discussed, is often used as a diagnostic marker in prostate cancers.[45,46] In general, DCO cases correlate with the age of patients. Consequently, an increase of non-specific coding with age is also attributable to DCO cases. Overall, proportions of the DCO cases for the five tumour sites were extremely low: 0.9% (n=117) of all colorectal cancer diagnoses, 0.5% (n=103) of all breast cancer diagnoses, 0.9% (n=181) of all prostate cancer diagnoses, 0.5% (n=37) of all urinary bladder diagnoses and 1.1% (n=119) of all haematological malignancies. As DCO cases are more common among elderly, the above described age gradient in non-specific coding may also attributed to poorer information among DCO cases. However, this age gradient is also visible after exclusion of DCO cases (data not shown), indicating that non-specific coding among elderly cannot be solely attributed to poorer information among DCO cases.

***Results of the analyses by year of diagnosis*** reveal that the proportions of non-specific coding of the variables morphology, basis of diagnosis and histological grade hardly vary for all cancer sites during the observation period. In addition, the overall proportions of non-specific coding of the variables morphology and basis of diagnosis are extremely low (0.3-1.9% and 0.1-0.3%, respectively) and that of variable histological grade only moderate (7-27%; except haematological malignancies, because not applicable). The distribution pattern for the two lines of TNM, which is compared for all tumour sites during the observation period, leaves no significant conclusions. The proportions of non-specific coding of topography decrease steadily for urinary bladder cancer (from 67% to 61% during 2008-12) and for breast cancer (from 28% to 16% during 2008-11). However, non-specific topography coding of breast cancer reaches its baseline value of 2008 in 2012 again. Non-specific coding of detection method also decreases strongly for all tumour sites, although for colorectal and breast cancer only until 2011. Accordingly, an improvement in coding of the variables topography (level 1) and first method of tumour detection (level 2) during 2008-11 can be inferred from this pattern. In contrast, assignments of almost all remaining topography and detection codes increase for the respective cancers during 2008-12. The improvement in coding of the variables topography and detection method may be based on a better availability of source information with years and/or better coding diligence of the medical professionals and/or registration units personnel, even though cantonal reporting sources and the access to these sources differs between the registries. One explanation for the rise in non-specific topography coding of breast cancer in 2012 could be that the registration **unit i**, which has the most breast cancer diagnoses (28%) of all registries, assigns code C50.9 'breast, unspecified' in 58% of its cases. Separate analysis of the distribution of topography codes by year of diagnosis for this registry reveals that indeed the proportions of code C50.9 almost doubled to 78% in 2012. However, the described pattern is not observed for the detection mode of breast cancer. Non-specific coding of detection mode declines steadily during 2008-12, although **unit i** registers 66% of its breast cancer diagnoses non-specifically. Separate analyses of the distribution of detection codes by year of diagnosis for all registration units with high proportions of non-specific breast cancer coding reveal that the non-specific proportions in **unit a** and **unit b** are mainly responsible for the observed stagnation

in 2012. These two registries have been established later than in other cantons and therefore cover only data for 2012 and 2010-12, respectively. Also, the non-specific proportions of colorectal cancer diagnoses in these two units account for the renewed slight rise in non-specific coding of the detection method for colorectal cancer in 2012.

***Results of the analyses of the variable date of diagnosis*** show that the distributions of date of all cancer diagnoses differ moderately between the registries. The observed slight seasonal variation is statistically significant for prostate cancer and for breast cancer only if not adjusting for the covariate screening. It is conceivable that an introduction of a cantonal mammography screening programme in a given month could have had an effect on the variation of the distribution across the registries. This assumption is mainly supported by the fact that distributions of no statistical significance were observed, even when controlling for the covariate 'year of diagnosis'. It would also be conceivable that the registries have in general problems to identify the first event stating the month in which the tumour was diagnosed, because of lacking or conflicting source information. October as breast cancer awareness month in Switzerland[47] could explain the observed increase in assignments of November as the month the tumour was diagnosed. This may contribute to an explanation of the observed seasonal variation, but does not explain the moderate differences in the distribution of the date of diagnoses between the cancer registries. Due to data protection concerns, some registration units did not transmit the exact date of diagnosis to NICER until 2014. The aim of the analysis of this outcome variable was to determine whether this circumstance may result in different seasonal patterns between the registers. As several studies[48–50] have reported, - albeit heterogeneous - seasonal variation for breast cancer incidence and prognosis, valid information regarding month of diagnosis is warranted. Seasonal variation in breast cancer incidence and/or prognosis have been linked to the influence of distinct climatic variations, hormonal changes due to seasonality related day/night length changes, and seasonal variations of vitamin D3 in cancer prognosis.

Information on ***patient treatment represented*** level 2 data, which means that the registration units could, at their discretion, transmit such information to NICER. However, five registries (**units b, c, f, i and m**) provided NICER with treatment information on all cancer sites. **Unit e** transmitted treatment data only for colorectal and breast cancer, and haematological malignancies. **Unit g** and **unit j** provided treatment information on colorectal, breast and prostate cancer. Additionally, **unit g** also provided treatment data for urinary bladder cancer. Treatment information is available for 49% of all colorectal cancer diagnoses, for 52% of all breast cancer diagnoses, for 26% of all prostate cancer and urinary bladder cancer diagnoses, and for 18% of all diagnosed haematological malignancies. Average treatment numbers per case range from 0.2 to 1.3 treatments, overall. The average treatment number per case of colorectal and breast cancer is the highest in **unit e**, that of prostate cancer in **units c and f**, that of urinary bladder cancer and haematological malignancies also in **unit c**. The observed differences could result from a different availability of source information on patient treatment.

***Results of the analyses by registration unit*** show that the distributions of non-specific topography coding differ substantially for urinary bladder and breast cancer between the registries (8-98% and 2-57%, respectively). Urinary bladder cancers are most commonly assigned C67.9 'bladder, NOS' (63%) and breast cancer diagnoses C50.9 'breast, unspecified' (24%). This coding pattern is not repeated in colorectal cancer. Overall proportion of non-specific coding using C18.9 'colon, unspecified' is extremely low (2%) and in a narrow range between the registries (<1.0-4.5%). Colorectal cancer diagnoses are most frequently assigned C20.9 'rectum, NOS' (26%), which is the only topographical code for rectal carci-

noma. As discussed for the results by year of diagnosis, one explanation for the wide range of non-specific coding of topography for breast cancer diagnoses is that **unit i** assigned code C50.9 in 58% of its breast cancer diagnoses and that the assignments of C50.9 almost doubled to 78% from 2011 to 2012. However, the wider range is only partly attributable to **unit i**, since the distributions of non-specific topography coding still differ substantially (2-39%), even when excluding the proportions in **unit i**. The proportions of nodal lymphomas range widely between the registries (19-45%), also that of leukaemias (41-60%) and extra-nodal lymphomas (11-25%). The overall proportion of extra-nodal lymphomas (18%) is below the 50% limit, as it is advisable to monitor the proportion of extra-nodal lymphomas in the database. In the case of a proportion of ≥50%, it is recommended to check the respective diagnoses in order to ensure correct coding and to adapt the site-key codes if necessary.[25]

The overall proportion of non-specific morphology coding for each cancer is extremely low (2-5%). The range of the corresponding frequencies in the registries is narrow (4-10%). The proportions of non-specific coding are the lowest in **unit h**, except for urinary bladder cancers, which has the lowest proportion in **unit j**. **Unit h** transmitted data on cancer diagnoses registered during 2008-10, with 3'729 diagnoses in total compared to the average number of 5,514 diagnoses per registry. **Unit j** collected information on 7,230 cancer diagnoses during 2008-12. Adenomas and adenocarcinomas are the most frequently recorded diagnosis for the sites colorectal and prostate (87% and 94%, respectively), ductal, lobular and medullary neoplasms for the site breast (93%) and transitional cell papillomas and carcinomas for the site urinary bladder. Of the haematological malignancies, Non-Hodgkin lymphomas are the most frequently recorded diagnosis (43%), followed by leukaemias (29), plasmacytomas (16%) and Hodgkin lymphomas (7%). The range of the corresponding frequencies for haematological malignancies in the registries is rather wide (7-20%). The detection mode of all above-mentioned cancer diagnoses was primarily unknown (48-86%). Detection following symptoms by the patient is second most common (22-41%), except for breast and prostate cancer. However, the proportion of breast cancer diagnoses detected by tumour symptoms is higher (8%) than that of mammography as systematic screening (5%). Breast cancer is second most frequently detected by general screening methods (22%) and thirst most frequently by mammography as opportunistic screening (10%). Prostate cancer is also second most frequently detected by general screening methods (32%).

Before pointing to the main results for level 2 registration data (detection method, histological grad and TNM stage), it must once again be expressly emphasised that the cancer registries were not obliged to provide NICER with information on level 2 data. Thus, the NICER national data differ by registration unit, according to availability of level 1 and/or level 2 data. In addition, grade information is irrelevant for most haematological malignancies. It is not applicable with leukaemia and primarily only used with follicular lymphomas according to the WHO classification of lymphoid neoplasms.[36,37] The ***UICC does not propose a TNM classification for Hodgkin lymphomas and NHL***, as TNM staging is not considered practical. Instead, the Ann Arbor classification, which was developed in 1971, is recommended, since no other convincing and tested staging system is available. There is no need for traditional TNM staging of ***leukaemias***, since they start in the bone marrow and spread to other organs. Instead, the 2016 revised WHO classification system of tumours of the haematopoietic and lymphoid tissues is recommended. [39,40]

**Units d, h, k and l** did not provide information on the first method of detection for all tumour sites and **unit e** additionally for prostate and urinary bladder cancer, and **unit g and unit j** for haematological malignancies. Therefore, the respective diagnoses were excluded from the site-specific analyses of the distri-

bution of codes ***by registration unit***. The detection mode of urinary bladder and breast cancers is primarily unknown (65% and 36%). The range of the corresponding frequencies in the registries is extremely wide (77% and 64%, respectively). Breast cancer is second most frequently detected by general screening methods (28). The proportions of mammography both as opportunistic and systematic screening are lower (13% and 7%, respectively). General screening methods for breast cancer also comprise check-ups, auto palpation, clinical breast examination by health care professionals and sonography as opportunistic screening, which explains the high proportion of this category. The range of the corresponding frequencies in the registries is wide (30% and 64%, respectively). Colorectal cancers are mainly detected following symptoms by the patient (55%). The proportions vary widely between the registries (34-86%). Second most frequently the detection mode of colorectal cancer is unknown (31%). **Unit i** has the most non-specific assignments (58%), not only for colorectal cancer, but also for breast cancer. Prostate cancer diagnoses are primarily detected by general screening methods (44%), as they also include screening by digital-rectal examination only and screening including PSA test. However, proportions of prostate cancer with unknown mode of detection are comparable high (41%). The range of the corresponding frequencies in the registries is extremely wide (75% and 86%, respectively). **Unit b** has the most non-specific assignments (88%), not only for prostate cancer, but also for urinary bladder cancer (89%). Haematological malignancies are primarily detected by tumour symptoms (44%) or unknown mode of detection (43%). The corresponding proportions vary widely between the registries (6-82% and 5-89%, respectively), while **unit b** codes non-specifically the most.

**Units d, k and l** did not provide information on the histological grade for all tumour sites and **unit e** additionally for prostate and urinary bladder cancer. Therefore, the respective diagnoses were excluded from the site-specific analyses of the distribution of codes ***by registration unit***. The overall proportion of non-specific histological grade coding for each cancer is moderate (7-20%), since the proportion of diagnoses with unknown histological grade are either the third or fourth highest of all code assignments. However, the range of the corresponding frequencies in the registries is moderate to wide (12-65%). Colorectal and breast cancer diagnoses are assigned most frequently grade 1 (well-differentiated tumour), urinary bladder cancer diagnoses grade 3 (poorly differentiated tumour) and prostate cancer diagnoses grade 3/4 (poorly differentiated or undifferentiated with Gleason 7-10). Non-specific coding of histological grade in colorectal cancer is highest for unknown tumour detection mode (80%). The remaining grade assignments are primarily consistent with symptomatically detected tumours. All histological grading codes for breast cancer (including non-specific coding) are most frequently assigned for diagnoses with unknown mode of detection (37-87%) and second most frequent in the case of general screening methods. This pattern is also observed for the assignments of histological grading codes for prostate cancer. However, prostate cancer diagnoses assigned grade 3/4 are mainly detected by general screening methods (49%). All histological grading codes (including non-specific coding) for urinary bladder cancer were also most frequently assigned if the detection method was unknown (60-86%) and second most frequently following symptoms by the patient. Five registration units (**registries b, c, f, h and i**) occasionally reported histological grade information for haematological malignancies. The overall proportion of non-specific histological grade coding is extremely high (95%) and ranges from 51% in **unit h** to 99.7% in **unit f**. The proportion of non-specific coding even slightly increases from 95% in 2010 to 99% in 2011/12.

Less than 2% of all cancer diagnoses were not coded according to ***the clinical and pathological TNM classification***, as some registries assigned wrong codes, e.g. for colorectal cancer cTNM codes ‘T1a-c’,

'T2b-c', 'T3a-c', 'T4c' and 'Ta'. Except **unit g**, all registries code their colorectal, breast, prostate and urinary bladder cancer diagnoses according to the 6th edition of the UICC TNM classification of malignant tumours and therefore assigned code cMX (5-11% overall). **Unit g** codes for prostate and urinary bladder cancers according to the 7th edition and follows the recommendation not to use cMX. Along the pathological line, **units f and j** also code all their diagnoses for the four tumour sites according to the 7th edition of the UICC TNM classification of malignant tumour, in addition, **unit g** for colorectal, breast and prostate cancers and **unit a** for colorectal and urinary bladder cancers. The remaining registries code according to the 6th edition of the UICC TNM classification of malignant tumours and therefore assign code pMX (11-35% overall). It is difficult to identify patterns in the distribution of the clinical and pathological TNM categories between the registers across all tumour sites, especially regarding the proportions of non-specific cTNM and pTNM coding. **Registration units b, c, e, f, h, i and m** code haematological malignancies using some clinical TNM classification. **Units c, e, h, i and m** also provide information on the pathological TNM classification.

The retrospective assessment of the coding patterns of thirteen Swiss cancer registries reveals that comparability of data is affected – to a certain degree – by differences in coding patterns. The quality of informative data such as the distribution of cancer cases coded as not otherwise specified (NOS) varies – as above discussed – between the registries. Therefore, the assumption of the null hypothesis that at least the proportion of non-specific coding is expected to be the same across the registries can be rejected. The observed wide range in non-specific coding is only partly attributed to the fact that not all cancer registries could provide data for all outcome variables, as only a subset of level 2 variables was available for certain incidence years, tumour sites and/or cancer registries. Most of the wide range in non-specific coding is probably attributable to inequity in access to source information. However, the observed differences in non-specific coding of the variables topography (level 1) and mode of detection (level 2) for colorectal, breast and urinary bladder cancer are directly attributable to individual coding patterns of registries, as a steady decline in non-specific coding, which indicates in general an improvement in coding during the observation period, is suddenly interrupted. The improvement in coding during the observation period is most likely to be attributable to a better availability of source information with years and/or better coding diligence of the medical professionals and/or registration units personnel, even though cantonal reporting sources and the access to these sources differ between the registries. On the other hand, the negative effect of a division into level 1 and level 2 data becomes immediately clear when discussing analyses for the distribution of breast cancer screening programmes. Intercantonal comparability is affected if information on the cantonal level is available, but not transmitted to the national level, as not classified as mandatory data (mandatory data corresponds to information necessary for nationwide basic incidence statistics). E.g. **registration units d, k and l** are among those registries with mammography screening programme being implemented either before or during the observation period. Therefore, these three units should at least have information available on breast cancer in situ cases. However, they do not transmit any information on in situ cancers. In contrast, **registries b, c and f** report in situ cancers for all applicable sites. The proportions of in situ cancers are not directly comparable, as some registries either do not record in situ cancers or do not submit data to NICER and screening programmes in which in situ cancers are frequently detected were introduced at different times. All results are based on chi-square statistics, while controlling for sex and age as covariates among others. However, due to the high number of cases,

further analyses should be carried out with direct age and sex standardised data for each tumour site-specific population to better assess the significance of the observed differences. High case numbers lead to statistically significant results ($p \leq 0.05$), even if only small differences are observed (false positives statistical results). Therefore, also a multiple testing correction procedure to adjust the statistical confidence measures based on the number of tests performed should be considered.

Although Swiss cancer registries follow standard international recommendations for data collection and coding procedures, the comparability of data on a national level might be concerned to the extent discussed, because data is collected in a multicentre setting. This leads to heterogeneity, e.g. in access and availability of source information, which might have an impact on data collection both for level 1 and level 2 data. As a consequence, the observed wide ranges in non-specific coding of cancers between the registries cannot be solely attributed to differences in coding patterns. At present, also the legal and structural framework of the registries differs, which might lead to different defined responsibilities and based on them to different personnel structures within a registry. However, the variation in coding between the registries is still of interest, as the study results for colorectal, breast and urinary bladder cancer reveal that differences in coding can be directly attributed to individual coding patterns of registries. These study findings strengthen the evidence for heterogeneity in registration and/or coding of Swiss cancer registries, which was already observed in several NICER pilot studies where substantial variation regarding completeness of case, completeness of follow-up and quality of vital status follow-up has been discussed.[19–21] From 2018 the new national law on cancer registration will consolidate the registration processes and therefore also the coding patterns of the registries, since one of the main objectives of the law is to assure the collection of comparable high quality data in Swiss cancer registries.[1]

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# 7 Annex

## 7.1 Critical appraisal

Die Datenbasis mit insgesamt 71,679 Diagnosen für die fünf Lokalisationen kolorektale Tumoren, Brustkrebs, Prostatakrebs, Harnblasenkrebs und hämatologische bösartige Erkrankungen stellt eine umfangreiche und ausreichende Fallzahl für eine aussagekräftige Analyse dar. Jedoch konnten die Ergebnisse aufgrund ihrer Fülle nicht im Detail diskutiert werden, was zur Fokussierung auf die wichtigsten Schlüsse führte. Dadurch konnten die wichtigsten Unterschiede bei der Kodierung der Zielvariablen zwischen den Registern einerseits aufgezeigt, andererseits nicht gänzlich hinreichend diskutiert werden. Zum Beispiel hätte bei der Zielvariablen TNM Stage eine Präsentation der Subkategorien neben den Hauptkategorien zusätzliche Vergleiche zwischen den Registern ermöglicht. Grundsätzlich bestand die Möglichkeit den Datensatz auf nur zwei bis drei Tumoren zu beschränken, wie auch eine Analyse mit weniger Zielvariablen vorzunehmen. Dies hätte den Rahmen der Masterarbeit enger gefasst und dadurch eine detaillierte Diskussion der Ergebnisse ermöglicht. Andererseits ermöglicht die Masterarbeit in ihrer umfangreichen Ausrichtung eine umfassendere Bestandsaufnahme der Kodierung der wichtigsten Variablen zur Beschreibung der Tumoren als solche und ihrer Stadien. Sie bietet daher eine bessere Grundlage für das Erkennen von allfälligen Kodierungsmustern in den Registern. Desweiteren können ausgehend vom aufbereiteten Datensatz der Masterarbeit weitere Analysen zur Kodierungspraxis erfolgen. Es ist an dieser Stelle noch einmal zu betonen, dass Unterschiede bei der Kodierung auch durch unterschiedliche regionale Rahmenbedingungen verursacht werden können (vgl. Kapitel 4 und 7.2). Auch hier bietet die vorliegende Arbeit Anhaltspunkte, mögliche Unterschiede in den Rahmenbedingungen in einer gesonderten Studie gezielt zu untersuchen.

## 7.2 Public health relevance

Mit Beginn des legislativen Entscheidungsprozesses für ein nationales Krebsregistrierungsgesetz haben seit 2010 zusätzlich acht Kantone und Halbkantone ein kantonales Krebsregister eröffnet, bzw. sich einem regionalen Krebsregister angeschlossen. Dies macht deutlich, dass Daten aus bevölkerungsbezogenen Krebsregistern eine wichtige Grundlage für eine wirkungsvolle Public Health Politik sind, um evidenzbasierte Entscheidungen in der Prävention und Früherkennung sowie Therapie von Krebserkrankungen treffen zu können. Ziel ist es, Zusammenhänge in der Entstehung von Krebserkrankungen zu identifizieren, die Erkrankungen zu vermeiden, die Frühentdeckung zu verbessern und bei Eintreten die Lebensqualität zu erhalten. Diese Zielsetzungen orientieren sich an der Aufgabe von Public Health, in öffentlichen und privaten Bereichen Bedingungen zu schaffen, unter denen Menschen gesund leben können und damit zur Verhütung von Krankheiten sowie zur Erhaltung und Förderung der Gesundheit in der Bevölkerung beizutragen (insbesondere in sozial benachteiligten Bevölkerungsgruppen).[51]

Die Hauptaufgabe der kantonalen Register besteht grundsätzlich darin, die bestmögliche Datenbasis für kantonale und nationale Statistiken zu liefern. Die Qualität der Datenbasis hängt einerseits vom Zugang zu vorhandenen Datenquellen ab (z.B. Spital-, Pathologie-, oder Autopsieberichte, Daten aus Screening-Programmen), andererseits vom Vorgang der Kodierung der erhaltenen Informationen (Einhaltung von Kodierungsstandards). Da für die kantonalen Register unterschiedliche strukturelle und finanzielle Rahmenbedingungen sowie Aufgaben vorliegen, sind sie in der personellen Ausstattung unterschiedlich besetzt, was zu Unterschieden in der Anwendung von Kodierungsstandards führen kann. Das nationale

Krebsregistrierungsgesetz setzt hier an, indem das Gesetzt ab 2018 die Einführung einer schweizweiten Meldepflicht und die Schaffung einer nationalen Krebsregistrierungsstelle vorsieht, die für die kantonalen Krebsregister und das Kinderkrebsregister die Datenstruktur und die Kodierungsstandards festlegt und regelmässig die Qualität der Datenregistrierung überprüft. Weiter ist die Koordinationsstelle für die Zusammenführung, Aufbereitung und Auswertung der Daten auf nationaler Ebene verantwortlich.[1]
Aktuell leiten die kantonalen Krebsregister ihre Daten anonymisiert zur gesamtschweizerischen Auswertung an das National Institute for Cancer Epidemiology and Registration (NICER) weiter und folgen in ihrer Kodierung dem Kerndatensatz von NICER. Dieser Datensatz ist gemäss den geltenden internationalen Kodierungsstandards definiert. Die Ergebnisse der Masterarbeit liefern einen Überblick zur Datenqualität in den kantonalen Krebsregistern. Dies im Hinblick auf eine bessere Vergleichbarkeit der Daten auf nationaler Ebene. Die Ergebnisse zeigen in erster Linie den Istzustand der Kodierung in den Registern auf, indem sie Muster in der Kodierung von wichtigen Variablen benennen, die der Beschreibung der Tumoren als solche und ihrer Stadien dienen. Dort wo die Muster von den gewünschten Standards abweichen, können die Ergebnisse in die Handbücher von NICER einfliessen und damit einen Beitrag zur Qualitätssicherung der Kodierung leisten. Folglich leistet die Masterarbeit einen Beitrag zur Generierung einer bestmöglichen Datenbasis für nationale, aber auch kantonale Statistiken – dies mit Blick auf evidenzbasierte Public Health Entscheidungen in der Prävention und Früherkennung sowie Therapie von Krebserkrankungen.

## 7.3 Supplementary information

### 7.3.1 Quality of data

Quality of data in cancer registration usually comprises four areas: comparability, completeness, validity (in terms of accuracy) and timeliness of data. The master thesis focuses on the ***comparability*** issue of coding patterns in Swiss cancer registries. Comparability of the statistics generated for different population groups (and over time) is essential to the meaningful interpretation of registry data and refers to the extent to which coding and classification procedures of cancer registries adhere to established guidelines. Basic requirements are a standardisation in classification and coding of new cases, and also consistency in basic definitions of incidence, such as rules for the recording and reporting of multiple primary cancers in same individual. ***Completeness*** of cancer registry data results in incidence rates and survival proportions close to their true value. This is only the case if maximum completeness in case-finding procedures can be achieved by combining multiple data sources in order to include all incident cancers occurring in the population. ***Validity (accuracy)*** refers to the proportion of cases with a given characteristic that truly have that attribute (how correct is the recorded information). It depends on the precision of source documents and the level of expertise in abstracting, coding and recoding. To describe a case in complete, all characteristics must be subject to a systematic search for accuracy. Accuracy of data can be expressed by different indicators, such as the proportion of cases in which the record contains poorly defined or unknown items or the proportion of cases defined on a histological investigation. ***Timeliness*** of result reporting is an aspect of registry quality, which influences the extent to which data are complete and accurate. Access to recent data is perceived as a priority by decision-makers. Since registries are constantly updating their database as reports are received, statistics for the recent periods will be incomplete, and therefore will

need future updates.[9,10,15] Further, data quality of cancer registries depend on the role of a cancer registry within the political, oncomedical and public health setting of each country. Nationwide collaboration is considered essential to ensure access to data and comparability of the results. Especially in countries with federal systems, contributions to data and infrastructure harmonisation is needed to foster a more prominent role of cancer registries within public health, clinical policy and cancer research.[4]

### 7.3.2 Outcome variables – coding scheme

The following coding scheme represents an modified extract of theNICER core dataset[7], including information from the ENCR recommendations for a standard dataset[30] and the IARC publication: cancer registration - principles and methods[31].

| Label of data item: | **topography** |
|---|---|
| Name of the data item: | topo |
| Character length: | 4 |
| Data format: | text |
| Codes: | ICD-O-3 topography codes. Always has a prefix of "C", followed by a three-digit number that indicates the site (two digits) and the subsite (one digit).<br>For example, in C184, the C18 indicates that the site is the colon and the 4 indicates that the subsite is the transverse colon. |

| Label of data item: | **morphology and behaviour** |
|---|---|
| Name of the data item: | mph |
| Character length: | 4 |
| Data format: | numeric |
| Codes: | ICD-O-M-codes without leading M (8000 to 9989):<br>The code is composed of four digits that indicate the cell type or histology. Further one digit that indicates the behaviour. The first four digits are separated from the last digit (behaviour) by a forward slash (/).<br>The behaviour digit can be 0 (benign), 1 (uncertain behaviour), 2 (carcinoma in situ), 3 (malignant, primary site), 6 (malignant, metastatic site), or 9 (malignant, uncertain whether primary or metastatic site).<br>E.g.:8140/6 = adenocarcinoma, metastatic, NOS<br>An adenocarcinoma which has spread from its original site of growth to another anatomic site. Not otherwise specified (NOS) describes the carcinoma as being of no special morphological cell type and therefore, does not appear in the list of terms modifying "adenocarcinoma" according the ICD-O-M codes. |

| Label of data item: | **basis of diagnosis** |
|---|---|
| Name of the data item: | Bd |
| Character length: | 1 |
| Data format: | Numeric |
| Codes: | 0 = Death Certificate Only (DCO)<br>1 = clinical<br>2 = clinical investigation<br>4 = specific tumour markers<br>5 = cytology<br>6 = histology of metastasis<br>7 = histology of primary tumour<br>9 = unknown |

| Label of data item: | **detection** |
|---|---|
| Name of the data item: | detec |
| Character length: | 3 |
| Data format: | numeric |
| Codes: | 100 = tumour symptoms<br>200 = incidental finding: diagnosis on the occasion of surveillance/treatment for another disease, incl. tumour aftercare for a previous primary tumour |

| | |
|---|---|
| | 300 = check-up/Screening; detailed codes provided for specific sites breast/ colon/prostate/ cervix<br>400 = death without autopsy<br>500 = death with autopsy<br>800 = other<br>900 = unknown<br>*Site specific: breast (topography C50):*<br>301 = self examination (auto palpation)<br>302 = mammography as opportunistic screening<br>303 = mammography within a screening programme<br>304 = sonography as opportunistic screening<br>305 = clinical breast examination by health care professional<br>*Specific site: colon (topography C18):*<br>310 = screening by hemocult with or without endoscopy<br>311 = screening by endoscopy only, type of endoscopy not specified<br>312 = screening by sigmoidoscopy only<br>313 = screening by colonoscopy only<br>*Specific site: prostate (topography C61):*<br>320 = screening by digital-rectal examination only<br>321 = screening including PSA test w or w/o digital-rectal examination<br>*Specific site: Cervix (Topography C53)*<br>330 = Screening by pap smear<br>331 = Screening by methods other than papsmear |

| Label of data item: | **TNM staging information** |
|---|---|
| Name of the data item: | ct, cn, cm, pt, pn, pm, pn_sn, y_ptnm |
| Character length: | 3 / 1 for pn_sn and y_ptnm |
| Data format: | Text / numeric for pn_sn and y_ptnm |
| Codes: | T1,T1a, T1b, T2,T3,…TX; N0,N1…NX; M0,M1…MX<br>T = primary tumour; N = regional lymph nodes; M = distant metastasis<br>Categorisation of the four stages of malignancy (T1 to T4). To simplify the description, the categories are grouped together as an *anatomical stage* classification (I -IV). By using the anatomically-based classification the local, regional and distant extent of the cancer is described. The pretreatment extent of disease is determined clinically by the *cTNM (ct, cn, cm)*, with information collected e.g. from laboratory tests, imaging or biopsy. Detailed post surgical pathologic *pTNM (pt, pn, pm)* provides additional information obtained from surgical excision and pathological examination of the entire primary tumour.[38]. |

| Label of data item: | **grade of differentiation** |
|---|---|
| Name of the data item: | grd |
| Character length: | 1 |
| Data format: | numeric |
| Codes: | 1 = grade I: well differentiated, differentiated NOS<br>2 = grade II: moderately differentiated, moderately well differentiated, intermediate differentiation<br>3 = grade III or Grade IV: poorly differentiated or undifferentiated, anaplastic<br>4 = grade IV: (reserved for liver and kidney)<br>8 = grade X: not applicable; grade cannot be assessed (e.g. melanoma) (also used if grade assessed based on material collected during/after neoadjuvant therapy)<br>9 = unknown, grade not mentioned in pathology report |

| | |
|---|---|
| | ***Explanation for tumour specific grading***<br>*Breast (C50):* invasive carcinoma grading according to Elston/Ellis, Histopathology 1991;19:403-410 (also known as Nottingham Grading System)<br>1 = Grade 1<br>2 = Grade 2<br>3 = Grade 3<br>8 = Grade X: grade cannot be assessed (also used if grade assessed based on material collected during/after neoadjuvant therapy)<br>9 = unknown; grade not mentioned in pathology report<br>*Prostate (C61):*<br>1 = grade 1, well differentiated (slight anaplasia; Gleason 2-4)<br>2 = grade 2, moderately differentiated (moderate anaplasia; Gleason 5-6)<br>3 = grade 3 or Grade 4, poorly or not differentiated (severe anaplasia; (Gleason 7-10)<br>8 = Grade X: grade cannot be assessed; (also use this code if grade assessed based on material collected during/after neoadjuvant therapy)<br>9 = unknown, grade not mentioned in pathology report. |

| Label of data item: | **month of incidence** (identifies month the tumour was diagnosed) |
|---|---|
| Name of the data item: | mmi |
| Character length: | 2 |
| Data format: | numeric |
| Codes: | from 1 to 12<br>The date of the first event (of the six listed below) to occur chronologically should be chosen. If an event of higher priority occurs within three months of the date initially chosen, the date of the higher priority event should take precedence.<br>Order of declining priority:<br>1. Date of first histological or cytological confirmation of this malignancy (with the exception of histology or cytology at autopsy). This date should be, in the following order:<br>a) date when the specimen was taken (biopsy)<br>b) date of receipt by the pathologist<br>c) date of the pathology report<br>2. Date of admission to the hospital because of this malignancy.<br>3. When evaluated at an outpatient clinic only: date of first consultation at the outpatient clinic because of this malignancy.<br>4. Date of diagnosis, other than 1, 2 or 3.<br>5. Date of death, if no information is available other than the fact that the patient has died because of a malignancy.<br>6. Date of death, if the malignancy is discovered at autopsy.<br>Whichever date is selected, the date of incidence should not be later than the date of the start of the treatment, or decision not to treat, or date of death. |

### 7.3.3 Breast cancer – supplementary tables

Breast carcinoma: distribution of ICD-O-3 topography codes by sex, age group and year of diagnosis (n=20,804)

| Topography code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| C50.0 Nipple and areola (n) | 7 | 78 | 20 | 18 | 14 | 23 | 10 | 20 | 11 | 16 | 23 | 15 | 85 |
| (%) | 4.7 | 0.4 | 0.3 | 0.4 | 0.3 | 0.7 | 0.7 | 0.5 | 0.3 | 0.4 | 0.6 | 0.3 | 0.4 |
| C50.1 Central portion (n) | 36 | 763 | 187 | 177 | 211 | 155 | 69 | 119 | 159 | 186 | 160 | 175 | 799 |
| (%) | 24.0 | 3.7 | 3.0 | 3.9 | 4.1 | 4.8 | 4.7 | 3.1 | 4.0 | 4.3 | 3.8 | 4.0 | 3.8 |
| C50.2 Upper-inner quadrant (n) | 3 | 1,820 | 540 | 401 | 502 | 268 | 112 | 360 | 325 | 384 | 393 | 361 | 1,823 |
| (%) | 2.0 | 8.8 | 8.5 | 8.8 | 9.7 | 8.2 | 7.6 | 9.4 | 8.2 | 8.8 | 9.4 | 8.1 | 8.8 |
| C50.3 Lower-inner quadrant (n) | 1 | 929 | 250 | 232 | 247 | 140 | 61 | 145 | 190 | 202 | 213 | 180 | 930 |
| (%) | 0.7 | 4.5 | 4.0 | 5.1 | 4.8 | 4.3 | 4.1 | 3.8 | 4.8 | 4.6 | 5.1 | 4.1 | 4.5 |
| C50.4 Upper-outer quadrant (n) | 5 | 6,166 | 1,934 | 1,423 | 1,514 | 932 | 368 | 1,155 | 1,181 | 1,375 | 1,298 | 1,162 | 6,171 |
| (% | 3.3 | 29.9 | 30.6 | 31.2 | 29.2 | 28.6 | 25.0 | 30.0 | 29.9 | 31.5 | 30.9 | 26.2 | 29.7 |
| C50.5 Lower-outer quadrant (n) | 2 | 1,415 | 443 | 318 | 342 | 223 | 91 | 245 | 281 | 307 | 319 | 265 | 1,417 |
| (% | 1.3 | 6.9 | 7.0 | 7.0 | 6.6 | 6.9 | 6.2 | 6.4 | 7.1 | 7.0 | 7.6 | 6.0 | 6.8 |
| C50.6 Axillary tail (n) | - | 47 | 18 | 9 | 7 | 8 | 5 | 7 | 6 | 10 | 10 | 14 | 47 |
| (%) | - | 0.2 | 0.3 | 0.2 | 0.1 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 |
| C50.8 Overlapping lesion (n) | 15 | 4,627 | 1,555 | 1,031 | 1,124 | 656 | 276 | 736 | 801 | 977 | 1,093 | 1,035 | 4,642 |
| (%) | 10.0 | 22.4 | 24.6 | 22.6 | 21.7 | 20.1 | 18.7 | 19.1 | 20.2 | 22.4 | 26.0 | 23.4 | 22.3 |
| C50.9 Breast, unspecified (n) | 81 | 4,809 | 1,377 | 950 | 1,230 | 852 | 481 | 1,060 | 1,003 | 913 | 688 | 1,226 | 4,890 |
| (%) | 54.0 | 23.3 | 21.8 | 20.8 | 23.7 | 26.2 | 32.7 | 27.6 | 25.4 | 20.9 | 16.4 | 27.7 | 23.5 |

(%) column percentage

Sex: Pearson chi2(8) = 352.1, p<0.0001 Age: Pearson chi2(32) = 193.79, p<0.0001 Year: Pearson chi2(56) = 97.40, p<0.0001

Breast carcinoma: distribution of ICD-O-3 morphology codes by sex, age group and year of diagnosis (n=20,804)

| Morphology code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| Squamous cell neoplasms (n) | 2 | 34 | 3 | 9 | 6 | 10 | 8 | 6 | 12 | 11 | 5 | 2 | 36 |
| (%) | 1.3 | 0.2 | 0.1 | 0.2 | 0.1 | 0.3 | 0.5 | 0.2 | 0.3 | 0.3 | 0.1 | 0.1 | 0.2 |
| Adenomas / adenocarcinomas (n) | 9 | 551 | 176 | 150 | 131 | 75 | 28 | 103 | 85 | 124 | 120 | 128 | 560 |
| (% | 6.0 | 2.7 | 2.8 | 3.3 | 2.5 | 2.3 | 1.9 | 2.7 | 2.2 | 2.8 | 2.9 | 2.9 | 2.7 |
| Cystic, mucinous and serous (n) | 1 | 326 | 63 | 53 | 66 | 85 | 60 | 74 | 59 | 65 | 69 | 60 | 327 |
| neoplasms (%) | 0.7 | 1.6 | 1.0 | 1.2 | 1.3 | 2.6 | 4.1 | 1.9 | 1.5 | 1.5 | 1.6 | 1.4 | 1.6 |
| Ductal, lobular and medullary (n) | 132 | 19,199 | 6,005 | 4,282 | 4,902 | 2,979 | 1,163 | 3,558 | 3,679 | 4,055 | 3,911 | 4,128 | 19,331 |
| neoplasms (%) | 88.0 | 93.0 | 95.0 | 93.9 | 94.4 | 91.5 | 79.0 | 92.5 | 93.0 | 92.8 | 93.2 | 93.1 | 92.9 |
| Complex epithelial neoplasms (n) | - | 75 | 21 | 17 | 16 | 13 | 8 | 11 | 18 | 14 | 18 | 14 | 75 |
| (% | - | 0.4 | 0.3 | 0.4 | 0.3 | 0.4 | 0.5 | 0.3 | 0.5 | 0.3 | 0.4 | 0.3 | 0.4 |
| Other, specified (n) | 1 | 78 | 22 | 18 | 17 | 10 | 12 | 16 | 16 | 13 | 10 | 24 | 79 |
| (%) | 0.7 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.8 | 0.4 | 0.4 | 0.3 | 0.2 | 0.5 | 0.4 |
| Other, unspecified (n) | 5 | 391 | 34 | 30 | 53 | 85 | 194 | 79 | 88 | 88 | 64 | 77 | 396 |
| (%) | 3.3 | 1.9 | 0.5 | 0.7 | 1.0 | 2.6 | 13.2 | 2.1 | 2.2 | 2.0 | 1.5 | 1.7 | 1.9 |

(%) column percentage

Sex: Pearson chi2(6) = 21.57, p=0.001 Age: Pearson chi2(24) = 1.3e+03, p<0.0001 Year: Pearson chi2(24) = 36.64, p=0.047

Breast carcinoma: method of 1st detection of tumour by sex, age group and year of diagnosis (n=20,804)

| Detection | Sex | | Age goup in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| Symptoms (n) | 25 | 1,758 | 525 | 332 | 354 | 367 | 205 | 178 | 217 | 420 | 474 | 494 | 1,783 |
| (%) | 16.7 | 8.5 | 8.3 | 7.3 | 6.8 | 11.3 | 13.9 | 4.6 | 5.5 | 9.6 | 11.3 | 11.1 | 8.6 |
| Incidental (n) | 5 | 777 | 141 | 133 | 178 | 192 | 138 | 64 | 149 | 184 | 196 | 189 | 782 |
| (%) | 3.3 | 3.8 | 2.2 | 2.9 | 3.4 | 5.9 | 9.4 | 1.7 | 3.8 | 4.2 | 4.7 | 4.3 | 3.8 |
| Screening (n) | 36 | 4,440 | 1,634 | 878 | 958 | 739 | 267 | 457 | 627 | 987 | 1,232 | 1,173 | 4,476 |
| (%) | 24.0 | 21.5 | 25.8 | 19.3 | 18.5 | 22.7 | 18.1 | 11.9 | 15.9 | 22.6 | 29.4 | 26.5 | 21.5 |
| Mammography as (n) | 1 | 2,013 | 595 | 533 | 628 | 234 | 24 | 236 | 290 | 421 | 467 | 600 | 2,014 |
| opportunistic screening (%) | 0.7 | 9.8 | 9.4 | 11.7 | 12.1 | 7.2 | 1.6 | 6.1 | 7.3 | 9.6 | 11.1 | 13.5 | 9.7 |
| Mammography as (n) | 1 | 1,105 | 262 | 426 | 403 | 13 | 2 | 156 | 157 | 198 | 272 | 323 | 1,106 |
| systematic screening (%) | 0.7 | 5.4 | 4.1 | 9.3 | 7.8 | 0.4 | 0.1 | 4.1 | 4.0 | 4.5 | 6.5 | 7.3 | 5.3 |
| Other (n) | - | 44 | 6 | 6 | 11 | 6 | 15 | - | 6 | 5 | 14 | 19 | 44 |
| (%) | - | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 1.0 | - | 0.2 | 0.1 | 0.3 | 0.4 | 0.2 |
| Unknown (n) | 82 | 10,517 | 3,161 | 2,251 | 2,659 | 1,706 | 822 | 2,756 | 2,511 | 2,155 | 1,542 | 1,635 | 10,599 |
| (%) | 54.7 | 50.9 | 50.0 | 49.4 | 51.2 | 52.4 | 55.8 | 71.6 | 63.5 | 49.3 | 36.7 | 36.9 | 51.0 |

(%) column percentage

Sex: Pearson chi2(6) = 31.62, p<0.0001 Age: Pearson chi2(24) = 1.1e+03, p<0.0001 Year: Pearson (24) = 1.7e+03, p<0.0001

Breast carcinoma: distribution of basis of diagnosis codes by sex, age group and year of diagnosis (n=20,804)

| Basis of diagnosis | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| DCO (n) | - | 103 | 2 | 1 | 10 | 26 | 64 | 16 | 29 | 21 | 15 | 22 | 103 |
| (%) | - | 0.5 | 0.0 | 0.0 | 0.2 | 0.8 | 4.3 | 0.4 | 0.7 | 0.5 | 0.4 | 0.5 | 0.5 |
| Clinical (n) | - | 83.0 | 1 | 2 | 6 | 11 | 63 | 14 | 18 | 18 | 18 | 15 | 83 |
| (%) | - | 0.4 | 0.0 | 0.0 | 0.1 | 0.3 | 4.3 | 0.4 | 0.5 | 0.4 | 0.4 | 0.3 | 0.4 |
| Clinical investigation (n) | - | 54.0 | 3 | 4 | 5 | 18 | 24 | 14 | 5 | 14 | 8 | 13 | 54 |
| (%) | - | 0.3 | 0.1 | 0.1 | 0.1 | 0.6 | 1.6 | 0.4 | 0.1 | 0.3 | 0.2 | 0.3 | 0.3 |
| Tumour markers (n) | - | 4 | - | 1 | 1 | - | 2 | - | 1 | - | - | 3 | 4 |
| (%) | - | 0.0 | - | 0.0 | 0.0 | - | 0.1 | - | 0.0 | - | - | 0.1 | 0.0 |
| Cytology (n) | 2 | 136 | 18 | 20 | 20 | 36 | 44 | 52 | 26 | 31 | 16 | 13 | 138 |
| (%) | 1.3 | 0.7 | 0.3 | 0.4 | 0.4 | 1.1 | 3.0 | 1.4 | 0.7 | 0.7 | 0.4 | 0.3 | 0.7 |
| Histology of metastasis (n) | 1 | 102 | 21 | 17 | 33 | 19 | 13 | 21 | 20 | 21 | 25 | 16 | 103 |
| (%) | 0.7 | 0.5 | 0.3 | 0.4 | 0.6 | 0.6 | 0.9 | 0.6 | 0.5 | 0.5 | 0.6 | 0.4 | 0.5 |
| Histology of primary tumour (n) | 146 | 20,161 | 6,277 | 4,512 | 5,112 | 3,147 | 1,259 | 3,730 | 3,857 | 4,263 | 4,113 | 4,344 | 20,307 |
| (%) | 97.3 | 97.6 | 99.3 | 99.0 | 98.5 | 96.6 | 85.5 | 97.0 | 97.5 | 97.6 | 98.0 | 98.0 | 97.6 |
| Unknown (n) | 1 | 11 | 2 | 2 | 4 | - | 4 | - | 1 | 2 | 2 | 7 | 12 |
| (%) | 0.7 | 0.1 | 0.0 | 0.0 | 0.1 | - | 0.3 | - | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 |

(%) column percentage

Sex: Pearson chi2(7) = 12.60, p=0.082 Age: Pearson chi2(28) = 1.5e+03, p<0.0001 Year: Pearson chi2(28) = 77.01, p<0.0001

Breast carcinoma: distribution of histological grading codes by sex, age group and year of diagnosis (n=20,804)

| Grade | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| Grade 1 (n) | 13 | 2,444 | 711 | 588 | 690 | 343 | 125 | 470 | 478 | 504 | 482 | 523 | 2,457 |
| (%) | 8.7 | 11.8 | 11.2 | 12.9 | 13.3 | 10.5 | 8.5 | 12.2 | 12.1 | 11.5 | 11.5 | 11.8 | 11.8 |
| Grade 2 (n) | 65 | 8,311 | 2,321 | 1,842 | 2,171 | 1,470 | 572 | 1,508 | 1,521 | 1,747 | 1,692 | 1,908 | 8,376 |
| (%) | 43.3 | 40.2 | 36.7 | 40.4 | 41.8 | 45.1 | 38.8 | 39.2 | 38.4 | 40.0 | 40.3 | 43.0 | 40.3 |
| Grade 3 (n) | 41 | 4,827 | 1,749 | 1,092 | 1,119 | 660 | 248 | 889 | 884 | 1,089 | 1,022 | 984 | 4,868 |
| (%) | 27.3 | 23.4 | 27.7 | 24.0 | 21.6 | 20.3 | 16.8 | 23.1 | 22.3 | 24.9 | 24.4 | 22.2 | 23.4 |
| Grade X (n) | - | 71 | 19 | 12 | 11 | 10 | 19 | 14 | 10 | 15 | 11 | 21 | 71 |
| (%) | - | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 1.3 | 0.4 | 0.3 | 0.3 | 0.3 | 0.5 | 0.3 |
| Unknown (n) | 31 | 5,001 | 1,524 | 1,025 | 1,200 | 774 | 509 | 966 | 1,064 | 1,015 | 990 | 997 | 5,032 |
| (%) | 20.7 | 24.2 | 24.1 | 22.5 | 23.1 | 23.8 | 34.6 | 25.1 | 26.9 | 23.2 | 23.6 | 22.5 | 24.2 |

(%) column percentage

Sex: Pearson chi2(4) = 3.91, p=0.419 Age: Pearson chi2(16) = 291.44, p<0.0001 Year: Pearson chi2(16) = 49.99, p<0.0001

Breast carcinoma: distribution of cT-codes (TNM) by sex, age group and year of diagnosis (n=20,804)

| cT-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| T0 (n) | - | 521 | 152 | 159 | 160 | 45 | 5 | 68 | 74 | 106 | 130 | 143 | 521 |
| (%) | - | 2.5 | 2.4 | 3.5 | 3.1 | 1.4 | 0.3 | 1.8 | 1.9 | 2.4 | 3.1 | 3.2 | 2.5 |
| T1 (n) | 19 | 3,199 | 939 | 764 | 882 | 490 | 143 | 506 | 627 | 675 | 691 | 719 | 3,218 |
| (%) | 12.7 | 15.5 | 14.9 | 16.8 | 17.0 | 15.0 | 9.7 | 13.2 | 15.9 | 15.5 | 16.5 | 16.2 | 15.5 |
| T2 (n) | 14 | 2,150 | 624 | 393 | 470 | 412 | 265 | 261 | 402 | 547 | 491 | 463 | 2,164 |
| (%) | 9.3 | 10.4 | 9.9 | 8.6 | 9.1 | 12.7 | 18.0 | 6.8 | 10.2 | 12.5 | 11.7 | 10.4 | 10.4 |
| T3 (n) | 3 | 393 | 148 | 68 | 69 | 62 | 49 | 60 | 73 | 90 | 92 | 81 | 396 |
| (%) | 2.0 | 1.9 | 2.3 | 1.5 | 1.3 | 1.9 | 3.3 | 1.6 | 1.8 | 2.1 | 2.2 | 1.8 | 1.9 |
| T4 (n) | 7 | 717 | 137 | 114 | 160 | 165 | 148 | 108 | 127 | 171 | 153 | 165 | 724 |
| (%) | 4.7 | 3.5 | 2.2 | 2.5 | 3.1 | 5.1 | 10.1 | 2.8 | 3.2 | 3.9 | 3.7 | 3.7 | 3.5 |
| TX (n) | 23 | 2,000 | 562 | 432 | 508 | 345 | 176 | 351 | 385 | 517 | 378 | 392 | 2,023 |
| (%) | 15.3 | 9.7 | 8.9 | 9.5 | 9.8 | 10.6 | 12.0 | 9.1 | 9.7 | 11.8 | 9.0 | 8.8 | 9.7 |
| Tis (n) | - | 91 | 31 | 17 | 32 | 9 | 2 | 7 | 23 | 26 | 20 | 15 | 91 |
| (%) | - | 0.4 | 0.5 | 0.4 | 0.6 | 0.3 | 0.1 | 0.2 | 0.6 | 0.6 | 0.5 | 0.3 | 0.4 |
| Unknown (n) | 84 | 11,583 | 3,731 | 2,612 | 2,910 | 1,729 | 685 | 2,486 | 2,246 | 2,238 | 2,242 | 2,455 | 11,667 |
| (%) | 56.0 | 56.1 | 59.0 | 57.3 | 56.1 | 53.1 | 46.5 | 64.6 | 56.8 | 51.2 | 53.4 | 55.4 | 56.1 |

(%) column percentage

Sex: Pearson chi2(7) = 10.88, p=0.144 Age: Pearson chi2(28) = 589.13, p<0.0001 Year: Pearson chi2(28) = 249.27, p<0.0001

Breast carcinoma: distribution of cN-codes (TNM) by sex, age group and year of diagnosis (n=20,804)

| cN-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| N0 (n) | 33 | 4,878 | 1,396 | 1,094 | 1,302 | 756 | 363 | 623 | 905 | 1,115 | 1,118 | 1,150 | 4,911 |
| (%) | 22.0 | 23.6 | 22.1 | 24.0 | 25.1 | 23.2 | 24.6 | 16.2 | 22.9 | 25.5 | 26.6 | 25.9 | 23.6 |
| N1 (n) | 8 | 1,536 | 490 | 288 | 333 | 294 | 139 | 214 | 306 | 355 | 333 | 336 | 1,544 |
| (%) | 5.3 | 7.4 | 7.8 | 6.3 | 6.4 | 9.0 | 9.4 | 5.6 | 7.7 | 8.1 | 7.9 | 7.6 | 7.4 |
| N2 (n) | 1 | 239 | 65 | 50 | 56 | 39 | 30 | 32 | 36 | 51 | 54 | 67 | 240 |
| (%) | 0.7 | 1.2 | 1.0 | 1.1 | 1.1 | 1.2 | 2.0 | 0.8 | 0.9 | 1.2 | 1.3 | 1.5 | 1.2 |
| N3 (n) | 3 | 209 | 70 | 49 | 47 | 31 | 15 | 21 | 36 | 56 | 55 | 44 | 212 |
| (%) | 2.0 | 1.0 | 1.1 | 1.1 | 0.9 | 1.0 | 1.0 | 0.6 | 0.9 | 1.3 | 1.3 | 1.0 | 1.0 |
| NX (n) | 27 | 2,594 | 655 | 545 | 625 | 482 | 314 | 515 | 481 | 629 | 503 | 493 | 2,621 |
| (%) | 18.0 | 12.6 | 10.4 | 12.0 | 12.0 | 14.8 | 21.3 | 13.4 | 12.2 | 14.4 | 12.0 | 11.1 | 12.6 |
| Unknown (n) | 78 | 11,198 | 3,648 | 2,533 | 2,828 | 1,655 | 612 | 2,442 | 2,193 | 2,164 | 2,134 | 2,343 | 11,276 |
| (%) | 52.0 | 54.2 | 57.7 | 55.6 | 54.5 | 50.8 | 41.6 | 63.5 | 55.4 | 49.5 | 50.9 | 52.9 | 54.2 |

(%) column percentage

Sex: Pearson chi2(5) = 6.42, p=0.267 Age: Pearson chi2(20) = 255.37, p<0.0001 Year: Pearson chi2(20) = 285.86, p<0.0001

Breast carcinoma: distribution of cM-codes (TNM) by sex, age group and year of diagnosis (n=20,804)

| cM-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| M0 (n) | 109 | 13,925 | 4,409 | 3,206 | 3,585 | 2,114 | 720 | 2,397 | 2,716 | 3,080 | 2,886 | 2,955 | 14,034 |
| (%) | 72.7 | 67.4 | 69.7 | 70.3 | 69.1 | 64.9 | 48.9 | 62.3 | 68.6 | 70.5 | 68.8 | 66.7 | 67.5 |
| M1 (n) | 5 | 955 | 201 | 182 | 251 | 210 | 116 | 119 | 174 | 232 | 212 | 223 | 956 |
| (%) | 3.3 | 4.6 | 3.2 | 4.0 | 4.8 | 6.5 | 7.9 | 3.1 | 4.4 | 5.3 | 5.1 | 5.0 | 4.6 |
| MX (n) | 6 | 916 | 210 | 137 | 174 | 182 | 219 | 145 | 128 | 181 | 220 | 248 | 922 |
| (%) | 4.0 | 4.4 | 3.3 | 3.0 | 3.4 | 5.6 | 14.9 | 3.8 | 3.2 | 4.1 | 5.2 | 5.6 | 4.4 |
| Unknown (n) | 30 | 4,858 | 1,504 | 1,034 | 1,181 | 751 | 418 | 1,186 | 939 | 877 | 879 | 1,007 | 4,888 |
| (%) | 20.0 | 23.5 | 23.8 | 22.7 | 22.8 | 23.1 | 28.4 | 30.8 | 23.7 | 20.1 | 20.9 | 22.7 | 23.5 |

(%) column percentage

Sex: Pearson chi2(3) = 1.99, p=0.574 Age: Pearson chi2(12) = 623.07, p<0.0001 Year: Pearson chi2(12) = 210.94, p<0.0001

Breast carcinoma: distribution of pT-codes (TNM) by sex, age group and year of diagnosis (n=20,804)

| pT-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| T0 (n) | - | 146 | 77 | 34 | 26 | 7 | 2 | 19 | 25 | 30 | 31 | 41 | 146 |
| (%) | - | 0.7 | 1.2 | 0.8 | 0.5 | 0.2 | 0.1 | 0.5 | 0.6 | 0.7 | 0.7 | 0.9 | 0.7 |
| T1 (n) | 45.0 | 7,250.0 | 2,366 | 1,831 | 2,003 | 912 | 183 | 1,200 | 1,392 | 1,539 | 1,499 | 1,665 | 7,295 |
| (%) | 30.0 | 35.1 | 37.4 | 40.2 | 38.6 | 28.0 | 12.4 | 31.2 | 35.2 | 35.2 | 35.7 | 37.6 | 35.1 |
| T2 (n) | 49 | 4,830 | 1,420 | 1,001 | 1,200 | 941 | 317 | 867 | 917 | 1,077 | 1,005 | 1,013 | 4,879 |
| (%) | 32.7 | 23.4 | 22.5 | 22.0 | 23.1 | 28.9 | 21.5 | 22.5 | 23.2 | 24.7 | 24.0 | 22.9 | 23.5 |
| T3 (n) | 4.0 | 731.0 | 242 | 135 | 167 | 124 | 67 | 134 | 147 | 154 | 146 | 154 | 735 |
| (%) | 2.7 | 3.5 | 3.8 | 3.0 | 3.2 | 3.8 | 4.6 | 3.5 | 3.7 | 3.5 | 3.5 | 3.5 | 3.5 |
| T4 (n) | 10 | 255 | 35 | 35 | 57 | 78 | 60 | 64 | 54 | 45 | 50 | 52 | 265 |
| (%) | 6.7 | 1.2 | 0.6 | 0.8 | 1.1 | 2.4 | 4.1 | 1.7 | 1.4 | 1.0 | 1.2 | 1.2 | 1.3 |
| TX (n) | 3 | 601 | 75 | 84 | 120 | 142 | 183 | 102 | 131 | 156 | 106 | 109 | 604 |
| (%) | 2.0 | 2.9 | 1.2 | 1.8 | 2.3 | 4.4 | 12.4 | 2.7 | 3.3 | 3.6 | 2.5 | 2.5 | 2.9 |
| Tis (n) | 7.0 | 1,674.0 | 634 | 436 | 440 | 153 | 18 | 246 | 319 | 364 | 366 | 386 | 1,681 |
| (%) | 4.7 | 8.1 | 10.0 | 9.6 | 8.5 | 4.7 | 1.2 | 6.4 | 8.1 | 8.3 | 8.7 | 8.7 | 8.1 |
| Unknown (n) | 32 | 5,167 | 1,475 | 1,003 | 1,178 | 900 | 643 | 1,215 | 972 | 1,005 | 994 | 1,013 | 5,199 |
| (%) | 21.3 | 25.0 | 23.3 | 22.0 | 22.7 | 27.6 | 43.7 | 31.6 | 24.6 | 23.0 | 23.7 | 22.9 | 25.0 |

(%) column percentage

Sex: Pearson chi2(7) = 45.87, p<0.0001 Age: Pearson chi2(28) = 1.6e+03, p<0.0001 Year: Pearson chi2(28) = 162.11, p<0.0001

Breast carcinoma: distribution of pN-codes (TNM) by sex, age group and year of diagnosis (n=20,804)

| pN-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| N0 (n) | 50 | 8,122 | 2,552 | 2,010 | 2,262 | 1,151 | 197 | 1,346 | 1,509 | 1,775 | 1,664 | 1,878 | 8,172 |
| (%) | 33.3 | 39.3 | 40.4 | 44.1 | 43.6 | 35.3 | 13.4 | 35.0 | 38.1 | 40.6 | 39.7 | 42.4 | 39.3 |
| N1 (n) | 26 | 3,608 | 1,279 | 806 | 904 | 525 | 120 | 600 | 730 | 789 | 757 | 758 | 3,634 |
| (%) | 17.3 | 17.5 | 20.2 | 17.7 | 17.4 | 16.1 | 8.2 | 15.6 | 18.5 | 18.1 | 18.0 | 17.1 | 17.5 |
| N2 (n) | 13 | 1,029 | 354 | 224 | 251 | 159 | 54 | 205 | 212 | 222 | 198 | 205 | 1,042 |
| (%) | 8.7 | 5.0 | 5.6 | 4.9 | 4.8 | 4.9 | 3.7 | 5.3 | 5.4 | 5.1 | 4.7 | 4.6 | 5.0 |
| N3 (n) | 6 | 596 | 182 | 119 | 168 | 104 | 29 | 123 | 114 | 121 | 121 | 123 | 602 |
| (%) | 4.0 | 2.9 | 2.9 | 2.6 | 3.2 | 3.2 | 2.0 | 3.2 | 2.9 | 2.8 | 2.9 | 2.8 | 2.9 |
| NX (n) | 11 | 1,231 | 223 | 198 | 253 | 275 | 293 | 214 | 246 | 290 | 248 | 244 | 1,242 |
| (%) | 7.3 | 6.0 | 3.5 | 4.3 | 4.9 | 8.4 | 19.9 | 5.6 | 6.2 | 6.6 | 5.9 | 5.5 | 6.0 |
| Unknown (n) | 44 | 6,068 | 1,734 | 1,202 | 1,353 | 1,043 | 780 | 1,359 | 1,146 | 1,173 | 1,209 | 1,225 | 6,112 |
| (%) | 29.3 | 29.4 | 27.4 | 26.4 | 26.1 | 32.0 | 53.0 | 35.3 | 29.0 | 26.8 | 28.8 | 27.6 | 29.4 |

(%) column percentage

Sex: Pearson chi2(5) = 6.51, p=0.260 Age: Pearson chi2(20) = 1.4e+03, p<0.0001 Year: Pearson chi2(20) = 117.14, p<0.0001

Breast carcinoma: distribution of pM-codes (TNM) by sex, age group and year of diagnosis (n=20,804)

| pM-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 150 | 20,654 | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,847 | 3,957 | 4,370 | 4,197 | 4,433 | 20,804 |
| M0 (n) | 1 | 341 | 107 | 71 | 112 | 40 | 12 | 38 | 69 | 43 | 5 | 187 | 342 |
| (%) | 0.7 | 1.7 | 1.7 | 1.6 | 2.2 | 1.2 | 0.8 | 1.0 | 1.7 | 1.0 | 0.1 | 4.2 | 1.6 |
| M1 (n) | 1 | 150 | 22 | 32 | 49 | 30 | 18 | 17 | 30 | 40 | 23 | 41 | 151 |
| (%) | 0.7 | 0.7 | 0.4 | 0.7 | 0.9 | 0.9 | 1.2 | 0.4 | 0.8 | 0.9 | 0.6 | 0.9 | 0.7 |
| MX (n) | 49 | 5,866 | 1,734 | 1,287 | 1,493 | 979 | 422 | 1,041 | 1,071 | 1,390 | 1,256 | 1,157 | 5,915 |
| (%) | 32.7 | 28.4 | 27.4 | 28.2 | 28.8 | 30.1 | 28.7 | 27.1 | 27.1 | 31.8 | 29.9 | 26.1 | 28.4 |
| Unknown (n) | 99 | 14,297 | 4,461 | 3,169 | 3,537 | 2,208 | 1,021 | 2,751 | 2,787 | 2,897 | 2,913 | 3,048 | 14,396 |
| (%) | 66.0 | 69.2 | 70.5 | 69.5 | 68.1 | 67.8 | 69.3 | 71.5 | 70.4 | 66.3 | 69.4 | 68.8 | 69.2 |

(%) column percentage

Sex: Pearson chi2(3) = 2.06, p=0.560 Age: Pearson chi2(12) = 49.89, p<0.0001 Year: Pearson chi2(12) = 314.47, p<0.0001

## 7.3.4 Prostate cancer – supplementary tables

Prostate carcinoma: distribution of morphology codes by age group and year of diagnosis (n=19,836)

| Morphology code | Age group in years | | | | | Year of diagnosis | | | | | overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| Adenomas / adenocarcinomas (n) | 715 | 4,521 | 8,190 | 4,231 | 1,041 | 3,646 | 3,775 | 3,791 | 3,840 | 3,646 | 18,698 |
| (%) | 98.5 | 98.3 | 98.0 | 92.2 | 66.7 | 93.9 | 94.0 | 94.2 | 94.7 | 94.7 | 94.3 |
| Cystic, mucinous and serous (n) | 1 | 13 | 7 | 6 | 4 | 1 | 5 | 7 | 12 | 6 | 31 |
| neoplasms (%) | 0.1 | 0.3 | 0.1 | 0.1 | 0.3 | 0.0 | 0.1 | 0.2 | 0.3 | 0.2 | 0.2 |
| Ductal, lobular and medullary (n) | - | 8 | 9 | 10 | 2 | 5 | 8 | 2 | 1 | 13 | 29 |
| neoplasms (%) | - | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.0 | 0.3 | 0.2 |
| Acinic cell carcinoma (n) | 3 | 29 | 44 | 21 | 7 | 31 | 29 | 38 | 1 | 5 | 104 |
| (%) | 0.4 | 0.6 | 0.5 | 0.5 | 0.5 | 0.8 | 0.7 | 0.9 | 0.0 | 0.1 | 0.5 |
| Other, specified (n) | 0 | 3 | 9 | 7 | 2 | 2 | 3 | 4 | 6 | 6 | 21 |
| (%) | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 |
| Other, unspecified (n) | 7 | 27 | 98 | 316 | 505 | 200 | 197 | 184 | 196 | 176 | 953 |
| (%) | 1.0 | 0.6 | 1.2 | 6.9 | 32.4 | 5.2 | 4.9 | 4.6 | 4.8 | 4.6 | 4.8 |

(%) column percentage Age: Pearson chi2(20) = 3.1e+03 , p<0.0001 Year: Pearson chi2(20) = 84.84, p<0.0001

Prostate carcinoma: Method of 1st detection of tumour by sex, age group and year of diagnosis (n=19,836)

| Detection | Age goup in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| Symptoms (n) | 18 | 74 | 177 | 227 | 167 | 74 | 69 | 124 | 190 | 206 | 663 |
| (%) | 2.5 | 1.6 | 2.1 | 4.9 | 10.7 | 1.9 | 1.7 | 3.1 | 4.7 | 5.4 | 3.3 |
| Incidental (n) | 28 | 140 | 401 | 411 | 139 | 141 | 130 | 191 | 275 | 382 | 1,119 |
| (%) | 3.9 | 3.0 | 4.8 | 9.0 | 8.9 | 3.6 | 3.2 | 4.7 | 6.8 | 9.9 | 5.6 |
| Screening (n) | 280 | 1,682 | 2,916 | 1,105 | 202 | 668 | 758 | 959 | 1,952 | 1,848 | 6,185 |
| (%) | 38.6 | 36.6 | 34.9 | 24.1 | 12.9 | 17.2 | 18.9 | 23.8 | 48.1 | 48.0 | 31.2 |
| Other (n) | 9 | 31 | 91 | 152 | 85 | 34 | 42 | 16 | 152 | 124 | 368 |
| (%) | 1.2 | 0.7 | 1.1 | 3.3 | 5.5 | 0.9 | 1.1 | 0.4 | 3.8 | 3.2 | 1.9 |
| Unknown (n) | 391 | 2,674 | 4,772 | 2,696 | 968 | 2,968 | 3,018 | 2,736 | 1,487 | 1,292 | 11,501 |
| (%) | 53.9 | 58.1 | 57.1 | 58.7 | 62.0 | 76.4 | 75.1 | 68.0 | 36.7 | 33.5 | 58.0 |

(%) column percentage Age: Pearson chi2(16) = 1.1e+03, p<0.0001 Year: Pearson chi2(16) = 3.0e+03, p<0.0001

Prostate carcinoma: distribution of basis of diagnosis codes by age group and year of diagnosis (n=19,836)

| Basis of diagnosis | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| DCO (n) | - | 1 | 13 | 56 | 111 | 37 | 49 | 34 | 38 | 23 | 181 |
| (%) | - | 0.0 | 0.2 | 1.2 | 7.1 | 1.0 | 1.2 | 0.8 | 0.9 | 0.6 | 0.9 |
| Clinical (n) | - | 2 | 7 | 49 | 99 | 49 | 31 | 38 | 24 | 15 | 157 |
| (%) | - | 0.0 | 0.1 | 1.1 | 6.3 | 1.3 | 0.8 | 0.9 | 0.6 | 0.4 | 0.8 |
| Clinical investigation (n) | - | 4 | 13 | 50 | 69 | 25 | 31 | 26 | 27 | 27 | 136 |
| (%) | - | 0.1 | 0.2 | 1.1 | 4.4 | 0.6 | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 |
| Tumour markers (n) | 1 | 6 | 34 | 154 | 218 | 76 | 74 | 85 | 91 | 87 | 413 |
| (%) | 0.1 | 0.1 | 0.4 | 3.4 | 14.0 | 2.0 | 1.8 | 2.1 | 2.2 | 2.3 | 2.1 |
| Cytology (n) | 1 | 6 | 26 | 41 | 26 | 43 | 16 | 14 | 13 | 14 | 100 |
| (%) | 0.1 | 0.1 | 0.3 | 0.9 | 1.7 | 1.1 | 0.4 | 0.4 | 0.3 | 0.4 | 0.5 |
| Histology of metastasis (n) | 3 | 14 | 20 | 37 | 32 | 17 | 14 | 30 | 20 | 25 | 106 |
| (%) | 0.4 | 0.3 | 0.2 | 0.8 | 2.1 | 0.4 | 0.4 | 0.8 | 0.5 | 0.7 | 0.5 |
| Histology of primary tumour (n) | 720 | 4,560 | 8,233 | 4,197 | 990 | 3,635 | 3,795 | 3,795 | 3,835 | 3,640 | 18,700 |
| (%) | 99.2 | 99.1 | 98.5 | 91.4 | 63.4 | 93.6 | 94.5 | 94.3 | 94.6 | 94.5 | 94.3 |
| Unknown (n) | 1 | 8 | 11 | 7 | 16 | 3 | 7 | 4 | 8 | 21 | 43 |
| (%) | 0.1 | 0.2 | 0.1 | 0.2 | 1.0 | 0.1 | 0.2 | 0.1 | 0.2 | 0.6 | 0.2 |

(%) column percentage Age: Pearson chi2(28) = 3.6e+03, p<0.0001 Year: Pearson chi2(28) = 102.44, p<0.0001

Prostate carcinoma: distribution of histological grading codes by age group and year of diagnosis (n=19,836)

| Grade | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| Grade 1, *Gleason 2-4* | (n) | 4 | 35 | 70 | 47 | 12 | 65 | 42 | 31 | 13 | 17 | 168 |
| | (%) | 0.6 | 0.8 | 0.8 | 1.0 | 0.8 | 1.7 | 1.1 | 0.8 | 0.3 | 0.4 | 0.9 |
| Grade 2, *Gleason 5-6* | (n) | 281 | 1,547 | 2,576 | 1,153 | 195 | 1,441 | 1,313 | 1,112 | 971 | 915 | 5,752 |
| | (%) | 38.7 | 33.6 | 30.8 | 25.1 | 12.5 | 37.1 | 32.7 | 27.6 | 23.9 | 23.8 | 29.0 |
| Grade 3/ 4, *Gleason 7-10* | (n) | 248 | 1,749 | 3,460 | 1,881 | 540 | 1,196 | 1,421 | 1,637 | 1,802 | 1,822 | 7,878 |
| | (%) | 34.2 | 38.0 | 41.4 | 41.0 | 34.6 | 30.8 | 35.4 | 40.7 | 44.4 | 47.3 | 39.7 |
| Grade X | (n) | 1 | 7 | 12 | 53 | 73 | 27 | 34 | 19 | 25 | 41 | 146 |
| | (%) | 0.1 | 0.2 | 0.1 | 1.2 | 4.7 | 0.7 | 0.9 | 0.5 | 0.6 | 1.1 | 0.7 |
| Unknown | (n) | 192 | 1,263 | 2,239 | 1,457 | 741 | 1,156 | 1,207 | 1,227 | 1,245 | 1,057 | 5,892 |
| | (%) | 26.5 | 27.5 | 26.8 | 31.7 | 47.5 | 29.8 | 30.1 | 30.5 | 30.7 | 27.4 | 29.7 |

(%) column percentage Age: Pearson chi2(16) = 879.27, p<0.0001 Year: Pearson chi2(16) = 432.18, p<0.0001

Prostate carcinoma: distribution of cT-codes (TNM) by sex, age group and year of diagnosis (n=19,836)

| cT-code | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| T0 (n) | 1 | 2 | 2 | 2 | - | - | 2 | 2 | 2 | 1 | 7 |
| (%) | 0.1 | 0.0 | 0.0 | 0.0 | - | - | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| T1 (n) | 146 | 879 | 1,700 | 1,016 | 206 | 643 | 680 | 724 | 934 | 966 | 3,947 |
| (%) | 20.1 | 19.1 | 20.3 | 22.1 | 13.2 | 16.6 | 16.9 | 18.0 | 23.0 | 25.1 | 19.9 |
| T2 (n) | 70 | 433 | 869 | 473 | 107 | 322 | 275 | 312 | 532 | 511 | 1,952 |
| (%) | 9.6 | 9.4 | 10.4 | 10.3 | 6.9 | 8.3 | 6.9 | 7.8 | 13.1 | 13.3 | 9.8 |
| T3 (n) | 26 | 133 | 346 | 315 | 81 | 131 | 159 | 161 | 238 | 212 | 901 |
| (%) | 3.6 | 2.9 | 4.1 | 6.9 | 5.2 | 3.4 | 4.0 | 4.0 | 5.9 | 5.5 | 4.5 |
| T4 (n) | 3 | 26 | 57 | 64 | 67 | 40 | 25 | 34 | 49 | 69 | 217 |
| (%) | 0.4 | 0.6 | 0.7 | 1.4 | 4.3 | 1.0 | 0.6 | 0.8 | 1.2 | 1.8 | 1.1 |
| TX (n) | 36 | 200 | 370 | 361 | 252 | 319 | 274 | 278 | 176 | 172 | 1,219 |
| (%) | 5.0 | 4.4 | 4.4 | 7.9 | 16.1 | 8.2 | 6.8 | 6.9 | 4.3 | 4.5 | 6.2 |
| Unknown (n) | 444 | 2,928 | 5,013 | 2,360 | 848 | 2,430 | 2,602 | 2,515 | 2,125 | 1,921 | 11,593 |
| (%) | 61.2 | 63.6 | 60.0 | 51.4 | 54.3 | 62.6 | 64.8 | 62.5 | 52.4 | 49.9 | 58.4 |

(%) column percentage Age: Pearson chi2(24) = 747.28, p<0.0001 Year: Pearson chi2(24) = 541.16, p<0.0001

Prostate carcinoma: distribution of cN-codes (TNM) by sex, age group and year of diagnosis (n=19,836)

| cN-code | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| N0 (n) | 237 | 1,412 | 2,643 | 1,409 | 284 | 1,054 | 1,023 | 904 | 1,542 | 1,462 | 5,985 |
| (%) | 32.6 | 30.7 | 31.6 | 30.7 | 18.2 | 27.1 | 25.5 | 22.5 | 38.0 | 38.0 | 30.2 |
| N1 (n) | 18 | 62 | 152 | 141 | 54 | 49 | 55 | 70 | 113 | 140 | 427 |
| (%) | 2.5 | 1.4 | 1.8 | 3.1 | 3.5 | 1.3 | 1.4 | 1.7 | 2.8 | 3.6 | 2.2 |
| N2 (n) | - | 1 | 6 | 2 | 1 | 1 | 2 | 3 | 3 | 1 | 10 |
| (%) | - | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 |
| N3 (n) | - | 1 | 2 | - | - | - | 2 | 1 | - | - | 3 |
| (%) | - | 0.0 | 0.0 | - | - | - | 0.1 | 0.0 | - | - | 0.0 |
| NX (n) | 54 | 366 | 763 | 757 | 397 | 517 | 478 | 586 | 365 | 391 | 2,337 |
| (%) | 7.4 | 8.0 | 9.1 | 16.5 | 25.4 | 13.3 | 11.9 | 14.6 | 9.0 | 10.2 | 11.8 |
| Unknown (n) | 417 | 2,759 | 4,791 | 2,282 | 825 | 2,264 | 2,457 | 2,462 | 2,033 | 1,858 | 11,074 |
| (%) | 57.4 | 60.0 | 57.3 | 49.7 | 52.9 | 58.3 | 61.2 | 61.2 | 50.1 | 48.2 | 55.8 |

(%) column percentage Age: Pearson chi2(20) = 637.91, p<0.0001 Year: Pearson chi2(20) = 541.76, p<0.0001

Prostate carcinoma: distribution of cM-codes (TNM) by sex, age group and year of diagnosis (n=19,836)

| cM-code | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| M0 (n) | 357 | 2,248 | 3,951 | 1,719 | 375 | 1,589 | 1,599 | 1,486 | 2,058 | 1,918 | 8,650 |
| (%) | 49.2 | 48.9 | 47.3 | 37.4 | 24.0 | 40.9 | 39.8 | 36.9 | 50.7 | 49.8 | 43.6 |
| M1 (n) | 22 | 58 | 197 | 286 | 173 | 107 | 113 | 130 | 179 | 207 | 736 |
| (%) | 3.0 | 1.3 | 2.4 | 6.2 | 11.1 | 2.8 | 2.8 | 3.2 | 4.4 | 5.4 | 3.7 |
| MX (n) | 57 | 338 | 645 | 459 | 198 | 309 | 309 | 388 | 358 | 333 | 1,697 |
| (%) | 7.9 | 7.4 | 7.7 | 10.0 | 12.7 | 8.0 | 7.7 | 9.6 | 8.8 | 8.6 | 8.6 |
| Unknown (n) | 290 | 1,957 | 3,564 | 2,127 | 815 | 1,880 | 1,996 | 2,022 | 1,461 | 1,394 | 8,753 |
| (%) | 39.9 | 42.5 | 42.7 | 46.3 | 52.2 | 48.4 | 49.7 | 50.2 | 36.0 | 36.2 | 44.1 |

(%) column percentage Age: Pearson chi2(12) = 756.35, p<0.0001 Year: Pearson chi2(12) = 401.80, p<0.0001

Prostate carcinoma: distribution of pT-codes (TNM) by sex, age group and year of diagnosis (n=19,836)

| pT-code | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| T1 (n) | 11 | 59 | 144 | 141 | 40 | 126 | 139 | 59 | 36 | 35 | 395 |
| (%) | 1.5 | 1.3 | 1.7 | 3.1 | 2.6 | 3.2 | 3.5 | 1.5 | 0.9 | 0.9 | 2.0 |
| T2 (n) | 230 | 1,307 | 1,663 | 213 | 34 | 607 | 650 | 595 | 842 | 753 | 3,447 |
| (%) | 31.7 | 28.4 | 19.9 | 4.6 | 2.2 | 15.6 | 16.2 | 14.8 | 20.8 | 19.6 | 17.4 |
| T3 (n) | 59 | 440 | 763 | 101 | 9 | 203 | 253 | 246 | 335 | 335 | 1,372 |
| (%) | 8.1 | 9.6 | 9.1 | 2.2 | 0.6 | 5.2 | 6.3 | 6.1 | 8.3 | 8.7 | 6.9 |
| T4 (n) | 3 | 12 | 7 | 7 | 5 | 12 | 8 | 4 | 1 | 9 | 34 |
| (%) | 0.4 | 0.3 | 0.1 | 0.2 | 0.3 | 0.3 | 0.2 | 0.1 | 0.0 | 0.2 | 0.2 |
| TX (n) | 38 | 235 | 599 | 520 | 175 | 414 | 385 | 412 | 179 | 177 | 1,567 |
| (%) | 5.2 | 5.1 | 7.2 | 11.3 | 11.2 | 10.7 | 9.6 | 10.2 | 4.4 | 4.6 | 7.9 |
| Tis (n) | 1 | 7 | 11 | 2 | - | 1 | 11 | 5 | 0 | 4 | 21 |
| (%) | 0.1 | 0.2 | 0.1 | 0.0 | - | 0.0 | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 |
| Unknown (n) | 384 | 2,541 | 5,170 | 3,607 | 1,298 | 2,522 | 2,571 | 2,705 | 2,663 | 2,539 | 13,000 |
| (%) | 52.9 | 55.2 | 61.9 | 78.6 | 83.2 | 64.9 | 64.0 | 67.2 | 65.7 | 65.9 | 65.5 |

(%) column percentage Age: Pearson chi2(24) = 1.9e+03 , p<0.0001 Year: Pearson chi2(24) = 468.24, p<0.0001

Prostate carcinoma: distribution of pN-codes (TNM) by sex, age group and year of diagnosis (n=19,836)

| pN-code | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| N0 (n) | 221 | 1,331 | 1,939 | 254 | 36 | 590 | 670 | 678 | 945 | 898 | 3,781 |
| (%) | 30.4 | 28.9 | 23.2 | 5.5 | 2.3 | 15.2 | 16.7 | 16.8 | 23.3 | 23.3 | 19.1 |
| N1 (n) | 23 | 101 | 142 | 21 | 6 | 53 | 53 | 69 | 58 | 60 | 293 |
| (%) | 3.2 | 2.2 | 1.7 | 0.5 | 0.4 | 1.4 | 1.3 | 1.7 | 1.4 | 1.6 | 1.5 |
| NX (n) | 57 | 392 | 786 | 585 | 184 | 531 | 502 | 485 | 250 | 236 | 2,004 |
| (%) | 7.9 | 8.5 | 9.4 | 12.7 | 11.8 | 13.7 | 12.5 | 12.1 | 6.2 | 6.1 | 10.1 |
| Unknown (n) | 425 | 2,777 | 5,490 | 3,731 | 1,335 | 2,711 | 2,792 | 2,794 | 2,803 | 2,658 | 13,758 |
| (%) | 58.5 | 60.4 | 65.7 | 81.3 | 85.5 | 69.8 | 69.5 | 69.4 | 69.1 | 69.0 | 69.4 |

(%) column percentage Age: Pearson chi2(12) = 1.4e+03, p<0.0001 Year: Pearson chi2(12) = 339.99, p<0.0001

Prostate carcinoma: distribution of pM-codes (TNM) by sex, age group and year of diagnosis (n=19,836)

| pM-code | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 6,324 | 4,559 | 5,191 | 3,257 | 1,473 | 3,885 | 4,017 | 4,026 | 4,056 | 3,852 | 19,836 |
| M0 (n) | 726 | 4,601 | 8,357 | 4,591 | 1,561 | 28 | 16 | 23 | 10 | 111 | 188 |
| (%) | 1.4 | 1.0 | 0.8 | 0.7 | 2.1 | 0.7 | 0.4 | 0.6 | 0.3 | 2.9 | 1.0 |
| M1 (n) | 3 | 6 | 20 | 21 | 19 | 11 | 12 | 16 | 14 | 16 | 69 |
| (%) | 0.4 | 0.1 | 0.2 | 0.5 | 1.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 |
| MX (n) | 127 | 774 | 1,233 | 634 | 184 | 716 | 737 | 750 | 408 | 341 | 2,952 |
| (%) | 17.5 | 16.8 | 14.8 | 13.8 | 11.8 | 18.4 | 18.4 | 18.6 | 10.1 | 8.9 | 14.9 |
| Unknown (n) | 586 | 3,773 | 7,036 | 3,906 | 1,326 | 3,130 | 3,252 | 3,237 | 3,624 | 3,384 | 16,627 |
| (%) | 80.7 | 82.0 | 84.2 | 85.1 | 85.0 | 80.6 | 81.0 | 80.4 | 89.4 | 87.9 | 83.8 |

(%) column percentage Age: Pearson chi2(12) = 104.86 , p<0.0001 Year: Pearson chi2(12) = 492.95, p<0.0001

## 7.3.5 Urinary bladder cancer – supplementary tables

Urinary bladder carcinoma: distribution of ICD-O-3 topography codes by sex, age group and year of diagnosis (n=6,902)

| Topography code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| C67.0 Trigone (n) | 103 | 31 | 6 | 20 | 50 | 46 | 12 | 26 | 15 | 23 | 33 | 37 | 134 |
| (%) | 1.9 | 2.0 | 1.2 | 1.8 | 2.4 | 2.1 | 1.2 | 2.1 | 1.2 | 1.6 | 2.3 | 2.5 | 1.9 |
| C67.1 Dome (n) | 55 | 23 | 4 | 7 | 24 | 30 | 13 | 20 | 13 | 10 | 22 | 13 | 78 |
| (%) | 1.0 | 1.5 | 0.8 | 0.6 | 1.2 | 1.4 | 1.3 | 1.6 | 1.0 | 0.7 | 1.5 | 0.9 | 1.1 |
| C67.2 Lateral wall (n) | 780 | 200 | 80 | 180 | 295 | 300 | 125 | 147 | 187 | 208 | 226 | 212 | 980 |
| (%) | 14.7 | 12.6 | 15.7 | 15.8 | 14.3 | 13.8 | 12.3 | 11.6 | 14.5 | 14.3 | 15.8 | 14.5 | 14.2 |
| C67.3 Anterior wall (n) | 28 | 6 | - | 3 | 11 | 14 | 6 | 5 | 10 | 4 | 5 | 10 | 34 |
| (%) | 0.5 | 0.4 | - | 0.3 | 0.5 | 0.7 | 0.6 | 0.4 | 0.8 | 0.3 | 0.4 | 0.7 | 0.5 |
| C67.4 Posterior wall (n) | 173 | 46 | 10 | 35 | 67 | 62 | 45 | 26 | 51 | 60 | 47 | 35 | 219 |
| (%) | 3.3 | 2.9 | 2.0 | 3.1 | 3.2 | 2.9 | 4.4 | 2.1 | 4.0 | 4.1 | 3.3 | 2.4 | 3.2 |
| C67.5 Bladder neck (n) | 69 | 11 | 7 | 10 | 24 | 28 | 11 | 14 | 11 | 18 | 16 | 21 | 80 |
| (%) | 1.3 | 0.7 | 1.4 | 0.9 | 1.2 | 1.3 | 1.1 | 1.1 | 0.9 | 1.2 | 1.1 | 1.4 | 1.2 |
| C67.6 Ureteric orifice (n) | 204 | 56 | 36 | 59 | 69 | 71 | 25 | 33 | 44 | 50 | 60 | 73 | 260 |
| (%) | 3.8 | 3.5 | 7.1 | 5.2 | 3.3 | 3.3 | 2.5 | 2.6 | 3.4 | 3.5 | 4.2 | 5.0 | 3.8 |
| C67.7 Urachus (n) | 7 | 3 | 5 | 3 | 2 | - | - | 2 | 3 | - | 3 | 2 | 10 |
| (%) | 0.1 | 0.2 | 1.0 | 0.3 | 0.1 | - | - | 0.2 | 0.2 | - | 0.2 | 0.1 | 0.1 |
| C67.8 Overlapping lesion (n) | 581 | 177 | 59 | 144 | 234 | 204 | 117 | 140 | 123 | 176 | 143 | 176 | 758 |
| (% | 10.9 | 11.1 | 11.6 | 12.7 | 11.3 | 9.4 | 11.5 | 11.1 | 9.6 | 12.1 | 10.0 | 12.0 | 11.0 |
| C67.9 Bladder, NOS (n) | 3,313 | 1,036 | 304 | 677 | 1,292 | 1,414 | 662 | 851 | 830 | 902 | 878 | 888 | 4,349 |
| (%) | 62.4 | 65.2 | 59.5 | 59.5 | 62.5 | 65.2 | 65.2 | 67.3 | 64.5 | 62.2 | 61.3 | 60.5 | 63.0 |

(%) column percentage

Sex: Pearson chi2(9) = 12.77, p=0.173 Age: Pearson chi2(36) = 104.77, p<0.0001 Year: Pearson chi2(36) = 75.22, p<0.0001

Urinary bladder carcinoma: distribution of ICD-O-3 morphology codes by sex, age group and year of diagnosis (n=6,902)

| Morphology code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| Squamous cell neoplasms (n) | 49 | 59 | 15 | 17 | 20 | 41 | 15 | 13 | 21 | 24 | 25 | 25 | 108 |
| (%) | 0.9 | 3.7 | 2.9 | 1.5 | 1.0 | 1.9 | 1.5 | 1.0 | 1.6 | 1.7 | 1.7 | 1.7 | 1.6 |
| Transitional cell papilloma (n) | 5,071 | 1,444 | 479 | 1,094 | 1,998 | 2,040 | 904 | 1,201 | 1,203 | 1,372 | 1,351 | 1,388 | 6,515 |
| and carcinoma (%) | 95.5 | 90.9 | 93.7 | 96.1 | 96.6 | 94.1 | 89.0 | 95.0 | 93.5 | 94.6 | 94.3 | 94.6 | 94.4 |
| Adenomas / adenocarcinomas (n) | 32 | 6 | 4 | 7 | 10 | 13 | 4 | 6 | 4 | 8 | 9 | 11 | 38 |
| (%) | 0.6 | 0.4 | 0.8 | 0.6 | 0.5 | 0.6 | 0.4 | 0.5 | 0.3 | 0.6 | 0.6 | 0.8 | 0.6 |
| Cystic, mucinous and serous (n) | 8 | 4 | 5 | 3 | 3 | 1 | - | 2 | 5 | 0 | 3 | 2 | 12 |
| neoplasms (%) | 0.2 | 0.3 | 1.0 | 0.3 | 0.2 | 0.1 | - | 0.2 | 0.4 | 0.0 | 0.2 | 0.1 | 0.2 |
| Other, specified (n) | 11 | 3 | 2 | 1 | 2 | 6 | 3 | 3 | 3 | 2 | 3 | 3 | 14 |
| (%) | 0.2 | 0.2 | 0.4 | 0.1 | 0.1 | 0.3 | 0.3 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 |
| Other, unspecified (n) | 142 | 73 | 6 | 16 | 35 | 68 | 90 | 39 | 51 | 45 | 42 | 38 | 215 |
| (%) | 2.7 | 4.6 | 1.2 | 1.4 | 1.7 | 3.1 | 8.9 | 3.1 | 4.0 | 3.1 | 2.9 | 2.6 | 3.1 |

(%) column percentage

Sex: Pearson chi2(5) = 79.95, p<0.0001 Age: Pearson chi2(20) = 183.49, p<0.0001 Year: Pearson chi2(20) = 16.82, p=0.665

Urinary bladder carcinoma: Method of 1st detection of tumour by sex, age group and year of diagnosis (n=6,902)

| Detection | Sex | | Age goup in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| Symptoms (n) | 1,190 | 350 | 117 | 249 | 466 | 461 | 247 | 242 | 234 | 269 | 383 | 412 | 1,540 |
| (%) | 22.4 | 22.0 | 22.9 | 21.9 | 22.5 | 21.3 | 24.3 | 19.2 | 18.2 | 18.5 | 26.7 | 28.1 | 22.3 |
| Incidental (n) | 225 | 42 | 15 | 54 | 86 | 75 | 37 | 58 | 56 | 42 | 63 | 48 | 267 |
| (%) | 4.2 | 2.6 | 2.9 | 4.8 | 4.2 | 3.5 | 3.6 | 4.6 | 4.4 | 2.9 | 4.4 | 3.3 | 3.9 |
| Screening (n) | 44 | 11 | 4 | 7 | 19 | 18 | 7 | 13 | 9 | 7 | 9 | 17 | 55 |
| (%) | 0.8 | 0.7 | 0.8 | 0.6 | 0.9 | 0.8 | 0.7 | 1.0 | 0.7 | 0.5 | 0.6 | 1.2 | 0.8 |
| Other (n) | 13 | 4 | 2 | 1 | 3 | 4 | 7 | - | 1 | 4 | 4 | 8 | 17 |
| (%) | 0.2 | 0.3 | 0.4 | 0.1 | 0.2 | 0.2 | 0.7 | - | 0.1 | 0.3 | 0.3 | 0.6 | 0.3 |
| Unknown (n) | 3,841 | 1,182 | 373 | 827 | 1,494 | 1,611 | 718 | 951 | 987 | 1,129 | 974 | 982 | 5,023 |
| (%) | 72.3 | 74.4 | 73.0 | 72.7 | 72.2 | 74.3 | 70.7 | 75.2 | 76.7 | 77.8 | 68.0 | 66.9 | 72.8 |

(%) column percentage

Sex: Pearson chi2(4) = 9.11, p=0.058 Age: Pearson chi2(16) = 21.36, p=0.165 Year: Pearson chi2(16) = 103.61, p<0.0001

Urinary bladder carcinoma: distribution of basis of diagnosis codes by sex, age group and year of diagnosis (n=6,902)

| Basis of diagnosis | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| DCO (n) | 27 | 10 | - | - | 4 | 11 | 22 | 9 | 6 | 10 | 6 | 6 | 37 |
| (%) | 0.5 | 0.6 | - | - | 0.2 | 0.5 | 2.2 | 0.7 | 0.5 | 0.7 | 0.4 | 0.4 | 0.5 |
| Clinical (n) | 12 | 10 | - | 1 | 2 | 8 | 11 | 5 | 6 | 4 | 3 | 4 | 22 |
| (%) | 0.2 | 0.6 | - | 0.1 | 0.1 | 0.4 | 1.1 | 0.4 | 0.5 | 0.3 | 0.2 | 0.3 | 0.3 |
| Clinical investigation (n) | 32 | 29 | - | - | 5 | 17 | 39 | 11 | 16 | 10 | 14 | 10 | 61 |
| (%) | 0.6 | 1.8 | - | - | 0.2 | 0.8 | 3.8 | 0.9 | 1.2 | 0.7 | 1.0 | 0.7 | 0.9 |
| Tumour markers (n) | 2 | 3 | - | - | - | 2 | 3 | 1 | 3 | 1 | - | - | 5 |
| (%) | 0.0 | 0.2 | - | - | - | 0.1 | 0.3 | 0.1 | 0.2 | 0.1 | - | - | 0.1 |
| Cytology (n) | 95 | 29 | 4 | 11 | 21 | 42 | 46 | 32 | 26 | 27 | 13 | 26 | 124 |
| (%) | 1.8 | 1.8 | 0.8 | 1.0 | 1.0 | 1.9 | 4.5 | 2.5 | 2.0 | 1.9 | 0.9 | 1.8 | 1.8 |
| Histology of metastasis (n) | 11 | 3 | 2 | 3 | 2 | 7 | - | - | 6 | 1 | 4 | 3 | 14 |
| (%) | 0.2 | 0.2 | 0.4 | 0.3 | 0.1 | 0.3 | - | - | 0.5 | 0.1 | 0.3 | 0.2 | 0.2 |
| Histology of primary tumour (n) | 5,122 | 1,498 | 503 | 1,121 | 2,030 | 2,074 | 892 | 1,203 | 1,224 | 1,396 | 1,390 | 1,407 | 6,620 |
| (%) | 96.4 | 94.3 | 98.4 | 98.5 | 98.2 | 95.6 | 87.8 | 95.2 | 95.1 | 96.2 | 97.0 | 95.9 | 95.9 |
| Unknown (n) | 12 | 7 | 2 | 2 | 4 | 8 | 3 | 3 | - | 2 | 3 | 11 | 19 |
| (%) | 0.2 | 0.4 | 0.4 | 0.2 | 0.2 | 0.4 | 0.3 | 0.2 | - | 0.1 | 0.2 | 0.8 | 0.3 |

(%) column percentage

Sex: Pearson chi2(7) = 33.79, p<0.0001 Age: Pearson chi2(28) = 297.49, p<0.0001 Year: Pearson chi2(28) = 50.49, p=0.006

Urinary bladder carcinoma: distribution of histological grading codes by sex, age group and year of diagnosis (n=6,902)

| Grade | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| Grade 1 (n) | 708 | 199 | 94 | 199 | 286 | 235 | 93 | 156 | 150 | 150 | 224 | 227 | 907 |
| (%) | 13.3 | 12.5 | 18.4 | 17.5 | 13.8 | 10.8 | 9.2 | 12.3 | 11.7 | 10.3 | 15.6 | 15.5 | 13.1 |
| Grade 2 (n) | 1,012 | 336 | 126 | 238 | 419 | 413 | 152 | 265 | 251 | 307 | 272 | 253 | 1,348 |
| (%) | 19.1 | 21.2 | 24.7 | 20.9 | 20.3 | 19.0 | 15.0 | 21.0 | 19.5 | 21.2 | 19.0 | 17.3 | 19.5 |
| Grade 3 (n) | 1,797 | 489 | 122 | 347 | 690 | 744 | 383 | 431 | 432 | 443 | 465 | 515 | 2,286 |
| (%) | 33.8 | 30.8 | 23.9 | 30.5 | 33.4 | 34.3 | 37.7 | 34.1 | 33.6 | 30.5 | 32.5 | 35.1 | 33.1 |
| Grade X (n) | 10 | 8 | 1 | 2 | 3 | 5 | 7 | 3 | 5 | 5 | 2 | 3 | 18 |
| (%) | 0.2 | 0.5 | 0.2 | 0.2 | 0.2 | 0.2 | 0.7 | 0.2 | 0.4 | 0.3 | 0.1 | 0.2 | 0.3 |
| Unknown (n) | 1,786 | 557 | 168 | 352 | 670 | 772 | 381 | 409 | 449 | 546 | 470 | 469 | 2,343 |
| (%) | 33.6 | 35.1 | 32.9 | 30.9 | 32.4 | 35.6 | 37.5 | 32.4 | 34.9 | 37.6 | 32.8 | 32.0 | 34.0 |

(%) column percentage

Sex: Pearson chi2(4) = 12.19, p=0.016 Age: Pearson chi2(16) = 110.41, p<0.0001 Year: Pearson chi2(16) = 48.60, p<0.0001

Urinary bladder carcinoma: distribution of cT-codes (TNM) by sex, age group and year of diagnosis (n=6,902)

| cT-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| T0 (n) | 11 | 3 | - | 7 | 3 | 3 | 1 | 4 | 2 | - | 6 | 2 | 14 |
| (%) | 0.2 | 0.2 | - | 0.6 | 0.2 | 0.1 | 0.1 | 0.3 | 0.2 | - | 0.4 | 0.1 | 0.2 |
| T1 (n) | 220 | 49 | 13 | 40 | 86 | 85 | 45 | 43 | 44 | 43 | 68 | 71 | 269 |
| (%) | 4.1 | 3.1 | 2.5 | 3.5 | 4.2 | 3.9 | 4.4 | 3.4 | 3.4 | 3.0 | 4.8 | 4.8 | 3.9 |
| T2 (n) | 175 | 52 | 11 | 29 | 73 | 64 | 50 | 37 | 46 | 43 | 50 | 51 | 227 |
| (%) | 3.3 | 3.3 | 2.2 | 2.6 | 3.5 | 3.0 | 4.9 | 2.9 | 3.6 | 3.0 | 3.5 | 3.5 | 3.3 |
| T3 (n) | 37 | 23 | 7 | 12 | 18 | 12 | 11 | 6 | 5 | 9 | 18 | 22 | 60 |
| (%) | 0.7 | 1.5 | 1.4 | 1.1 | 0.9 | 0.6 | 1.1 | 0.5 | 0.4 | 0.6 | 1.3 | 1.5 | 0.9 |
| T4 (n) | 36 | 16 | 5 | 6 | 13 | 19 | 9 | 8 | 14 | 9 | 11 | 10 | 52 |
| (%) | 0.7 | 1.0 | 1.0 | 0.5 | 0.6 | 0.9 | 0.9 | 0.6 | 1.1 | 0.6 | 0.8 | 0.7 | 0.8 |
| TX (n) | 159 | 53 | 13 | 25 | 44 | 75 | 55 | 64 | 37 | 64 | 30 | 17 | 212 |
| (%) | 3.0 | 3.3 | 2.5 | 2.2 | 2.1 | 3.5 | 5.4 | 5.1 | 2.9 | 4.4 | 2.1 | 1.2 | 3.1 |
| Ta (n) | 404 | 122 | 33 | 102 | 177 | 164 | 50 | 129 | 137 | 116 | 75 | 69 | 526 |
| (%) | 7.6 | 7.7 | 6.5 | 9.0 | 8.6 | 7.6 | 4.9 | 10.2 | 10.6 | 8.0 | 5.2 | 4.7 | 7.6 |
| Tis (n) | 33 | 6 | 2 | 3 | 12 | 11 | 11 | 11 | 8 | 5 | 5 | 10 | 39 |
| (%) | 0.6 | 0.4 | 0.4 | 0.3 | 0.6 | 0.5 | 1.1 | 0.9 | 0.6 | 0.3 | 0.4 | 0.7 | 0.6 |
| Unknown (n) | 4,238 | 1,265 | 427 | 914 | 1,642 | 1,736 | 784 | 962 | 994 | 1,162 | 1,170 | 1,215 | 5,503 |
| (%) | 79.8 | 79.6 | 83.6 | 80.3 | 79.4 | 80.0 | 77.2 | 76.1 | 77.2 | 80.1 | 81.7 | 82.8 | 79.7 |

(%) column percentage

Sex: Pearson chi2(8) = 14.99, p=0.059 Age: Pearson chi2(32) = 89.39, p<0.0001 Year: Pearson chi2(32) = 149.66, p<0.0001

Urinary bladder carcinoma: distribution of cN-codes (TNM) by sex, age group and year of diagnosis (n=6,902)

| cN-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| N0 (n) | 1,577 | 441 | 147 | 352 | 651 | 639 | 229 | 332 | 333 | 299 | 587 | 467 | 2,018 |
| (%) | 29.7 | 27.8 | 28.8 | 30.9 | 31.5 | 29.5 | 22.5 | 26.3 | 25.9 | 20.6 | 41.0 | 31.8 | 29.2 |
| N1 (n) | 44 | 15 | 5 | 9 | 19 | 20 | 6 | 8 | 9 | 7 | 19 | 16 | 59 |
| (%) | 0.8 | 0.9 | 1.0 | 0.8 | 0.9 | 0.9 | 0.6 | 0.6 | 0.7 | 0.5 | 1.3 | 1.1 | 0.9 |
| N2 (n) | 27 | 13 | 7 | 9 | 9 | 13 | 2 | 3 | 4 | 11 | 10 | 12 | 40 |
| (%) | 0.5 | 0.8 | 1.4 | 0.8 | 0.4 | 0.6 | 0.2 | 0.2 | 0.3 | 0.8 | 0.7 | 0.8 | 0.6 |
| N3 (n) | 8 | 4 | 2 | 4 | 2 | 3 | 1 | - | - | 1 | 4 | 7 | 12 |
| (%) | 0.2 | 0.3 | 0.4 | 0.4 | 0.1 | 0.1 | 0.1 | - | - | 0.1 | 0.3 | 0.5 | 0.2 |
| NX (n) | 452 | 141 | 37 | 74 | 162 | 183 | 137 | 107 | 105 | 107 | 95 | 179 | 593 |
| (%) | 8.5 | 8.9 | 7.2 | 6.5 | 7.8 | 8.4 | 13.5 | 8.5 | 8.2 | 7.4 | 6.6 | 12.2 | 8.6 |
| Unknown (n) | 3,205 | 975 | 313 | 690 | 1,225 | 1,311 | 641 | 814 | 836 | 1,026 | 718 | 786 | 4,180 |
| (%) | 60.3 | 61.4 | 61.3 | 60.6 | 59.2 | 60.4 | 63.1 | 64.4 | 65.0 | 70.7 | 50.1 | 53.6 | 60.6 |

(%) column percentage

Sex: Pearson chi2(5) = 4.90, p=0.428 Age: Pearson chi2(20) = 74.23, p<0.0001 Year: Pearson chi2(20) = 246.45, p<0.0001

Urinary bladder carcinoma: distribution of cM-codes (TNM) by sex, age group and year of diagnosis (n=6,902)

| cM-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| M0 (n) | 1,887 | 542 | 185 | 423 | 772 | 759 | 290 | 422 | 394 | 377 | 652 | 584 | 2,429 |
| (%) | 35.5 | 34.1 | 36.2 | 37.2 | 37.3 | 35.0 | 28.5 | 33.4 | 30.6 | 26.0 | 45.5 | 39.8 | 35.2 |
| M1 (n) | 77 | 37 | 12 | 23 | 30 | 33 | 16 | 15 | 17 | 19 | 36 | 27 | 114 |
| (%) | 1.5 | 2.3 | 2.4 | 2.0 | 1.5 | 1.5 | 1.6 | 1.2 | 1.3 | 1.3 | 2.5 | 1.8 | 1.7 |
| MX (n) | 318 | 103 | 26 | 62 | 119 | 135 | 79 | 56 | 70 | 74 | 91 | 130 | 421 |
| (%) | 6.0 | 6.5 | 5.1 | 5.5 | 5.8 | 6.2 | 7.8 | 4.4 | 5.4 | 5.1 | 6.4 | 8.9 | 6.1 |
| Unknown (n) | 3,031 | 907 | 288 | 630 | 1,147 | 1,242 | 631 | 771 | 806 | 981 | 654 | 726 | 3,938 |
| (%) | 57.1 | 57.1 | 56.4 | 55.4 | 55.5 | 57.3 | 62.1 | 61.0 | 62.6 | 67.6 | 45.6 | 49.5 | 57.1 |

(%) column percentage

Sex: Pearson chi2(3) = 6.91, p=0.075 Age: Pearson chi2 (12) = 32.96, p=0.001 Year: Pearson chi2(12) = 220.02, p<0.0001

Urinary bladder carcinoma: distribution of pT-codes (TNM) by sex, age group and year of diagnosis (n=6,902)

| pT-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| T0 (n) | 8 | 3 | 1 | 2 | 6 | 2 | - | - | - | 1 | 3 | 7 | 11 |
| (%) | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.1 | - | - | - | 0.1 | 0.2 | 0.5 | 0.2 |
| T1 (n) | 766 | 188 | 41 | 146 | 296 | 315 | 156 | 163 | 176 | 177 | 210 | 228 | 954 |
| (%) | 14.4 | 11.8 | 8.0 | 12.8 | 14.3 | 14.5 | 15.4 | 12.9 | 13.7 | 12.2 | 14.7 | 15.5 | 13.8 |
| T2 (n) | 377 | 141 | 27 | 74 | 143 | 160 | 114 | 111 | 98 | 87 | 96 | 126 | 518 |
| (%) | 7.1 | 8.9 | 5.3 | 6.5 | 6.9 | 7.4 | 11.2 | 8.8 | 7.6 | 6.0 | 6.7 | 8.6 | 7.5 |
| T3 (n) | 149 | 76 | 24 | 34 | 78 | 72 | 17 | 42 | 30 | 45 | 53 | 55 | 225 |
| (%) | 2.8 | 4.8 | 4.7 | 3.0 | 3.8 | 3.3 | 1.7 | 3.3 | 2.3 | 3.1 | 3.7 | 3.8 | 3.3 |
| T4 (n) | 48 | 12 | 4 | 14 | 17 | 23 | 2 | 9 | 12 | 7 | 16 | 16 | 60 |
| (%) | 0.9 | 0.8 | 0.8 | 1.2 | 0.8 | 1.1 | 0.2 | 0.7 | 0.9 | 0.5 | 1.1 | 1.1 | 0.9 |
| TX (n) | 172 | 37 | 8 | 25 | 49 | 67 | 60 | 39 | 44 | 57 | 33 | 36 | 209 |
| (%) | 3.2 | 2.3 | 1.6 | 2.2 | 2.4 | 3.1 | 5.9 | 3.1 | 3.4 | 3.9 | 2.3 | 2.5 | 3.0 |
| Ta (n) | 1,641 | 462 | 211 | 396 | 659 | 642 | 195 | 405 | 407 | 434 | 458 | 399 | 2,103 |
| (%) | 30.9 | 29.1 | 41.3 | 34.8 | 31.9 | 29.6 | 19.2 | 32.0 | 31.6 | 29.9 | 32.0 | 27.2 | 30.5 |
| Tis (n) | 121 | 22 | 5 | 28 | 47 | 53 | 10 | 29 | 24 | 35 | 24 | 31 | 143 |
| (%) | 2.3 | 1.4 | 1.0 | 2.5 | 2.3 | 2.4 | 1.0 | 2.3 | 1.9 | 2.4 | 1.7 | 2.1 | 2.1 |
| Unknown (n) | 2,031 | 648 | 190 | 419 | 773 | 835 | 462 | 466 | 496 | 608 | 540 | 569 | 2,679 |
| (%) | 38.2 | 40.8 | 37.2 | 36.8 | 37.4 | 38.5 | 45.5 | 36.9 | 38.5 | 41.9 | 37.7 | 38.8 | 38.8 |

(%) column percentage

Sex: Pearson chi2(8) = 37.59, p<0.0001 Age: Pearson chi2(32) = 199.80, p<0.0001 Year: Pearson chi2(32) = 67.02, p<0.0001

Urinary bladder carcinoma: distribution of pN-codes (TNM) by sex, age group and year of diagnosis (n= 6,902)

| pN-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| N0 (n) | 420 | 132 | 43 | 106 | 201 | 172 | 30 | 113 | 116 | 129 | 74 | 120 | 552 |
| (%) | 7.9 | 8.3 | 8.4 | 9.3 | 9.7 | 7.9 | 3.0 | 8.9 | 9.0 | 8.9 | 5.2 | 8.2 | 8.0 |
| N1 (n) | 46 | 17 | 3 | 16 | 22 | 16 | 6 | 9 | 16 | 11 | 12 | 15 | 63 |
| (%) | 0.9 | 1.1 | 0.6 | 1.4 | 1.1 | 0.7 | 0.6 | 0.7 | 1.2 | 0.8 | 0.8 | 1.0 | 0.9 |
| N2 (n) | 44 | 24 | 13 | 14 | 19 | 20 | 2 | 16 | 10 | 14 | 13 | 15 | 68 |
| (%) | 0.8 | 1.5 | 2.5 | 1.2 | 0.9 | 0.9 | 0.2 | 1.3 | 0.8 | 1.0 | 0.9 | 1.0 | 1.0 |
| N3 (n) | 5 | 3 | 1 | 1 | 4 | 2 | - | 1 | - | 2 | 3 | 2 | 8 |
| (%) | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | - | 0.1 | - | 0.1 | 0.2 | 0.1 | 0.1 |
| NX (n) | 713 | 194 | 51 | 146 | 261 | 282 | 167 | 214 | 195 | 201 | 163 | 134 | 907 |
| (%) | 13.4 | 12.2 | 10.0 | 12.8 | 12.6 | 13.0 | 16.4 | 16.9 | 15.2 | 13.9 | 11.4 | 9.1 | 13.1 |
| Unknown (n) | 4,085 | 1,219 | 400 | 855 | 1,561 | 1,677 | 811 | 911 | 950 | 1,094 | 1,168 | 1,181 | 5,304 |
| (%) | 76.9 | 76.7 | 78.3 | 75.1 | 75.5 | 77.3 | 79.8 | 72.1 | 73.8 | 75.4 | 81.5 | 80.5 | 76.9 |

(%) column percentage

Sex: Pearson chi2(3) = 2.61, P=0.455 Age: Pearson chi2(12) = 19.55, P=0.076 Year: Pearson chi2(12) = 133.66, p<0.0001

Urinary bladder carcinoma: distribution of pM-codes (TNM) by sex, age group and year of diagnosis (n=6,902)

| pM-code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,313 | 1,589 | 511 | 1,138 | 2,068 | 2,169 | 1,016 | 1,264 | 1,287 | 1,451 | 1,433 | 1,467 | 6,902 |
| M0 (n) | 180 | 60 | 13 | 43 | 80 | 84 | 20 | 57 | 74 | 61 | 1 | 47 | 240 |
| (%) | 3.4 | 3.8 | 2.5 | 3.8 | 3.9 | 3.9 | 2.0 | 4.5 | 5.8 | 4.2 | 0.1 | 3.2 | 3.5 |
| M1 (n) | 27 | 8 | 4 | 6 | 11 | 9 | 5 | 5 | 8 | 6 | 7 | 9 | 35 |
| (%) | 0.5 | 0.5 | 0.8 | 0.5 | 0.5 | 0.4 | 0.5 | 0.4 | 0.6 | 0.4 | 0.5 | 0.6 | 0.5 |
| MX (n) | 792 | 213 | 59 | 157 | 301 | 317 | 171 | 240 | 208 | 227 | 178 | 152 | 1,005 |
| (%) | 14.9 | 13.4 | 11.6 | 13.8 | 14.6 | 14.6 | 16.8 | 19.0 | 16.2 | 15.6 | 12.4 | 10.4 | 14.6 |
| Unknown (n) | 4,314 | 1,308 | 435 | 932 | 1,676 | 1,759 | 820 | 962 | 997 | 1,157 | 1,247 | 1,259 | 5,622 |
| (%) | 81.2 | 82.3 | 85.1 | 81.9 | 81.0 | 81.1 | 80.7 | 76.1 | 77.5 | 79.7 | 87.0 | 85.8 | 81.5 |

(%) column percentage

Sex: Pearson chi2(3) = 2.61, P=0.455 Age: Pearson chi2(12) = 19.55, P=0.076 Year: Pearson chi2(12) = 133.66, p<0.0001

## 7.3.6 Haematological malignancies – supplementary tables

Haematological malignancies: distribution of ICD-O-3 topography codes by sex, age group and year of diagnosis (n=10,399)

| Topography code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,734 | 4,665 | 2,419 | 1,633 | 2,541 | 2,627 | 1,179 | 1,960 | 2,093 | 2,102 | 2,069 | 2,175 | 10,399 |
| Extra-nodal lymphomas (n) | 1,016 | 804 | 428 | 282 | 421 | 459 | 230 | 341 | 321 | 382 | 370 | 406 | 1,820 |
| (%) | 17.7 | 17.2 | 17.7 | 17.3 | 16.6 | 17.5 | 19.5 | 17.4 | 15.3 | 18.2 | 17.9 | 18.7 | 17.5 |
| Nodal lymphomas (n) | 1,758 | 1,508 | 1,015 | 525 | 702 | 730 | 294 | 667 | 664 | 609 | 629 | 697 | 3,266 |
| (%) | 30.7 | 32.3 | 42.0 | 32.2 | 27.6 | 27.8 | 24.9 | 34.0 | 31.7 | 29.0 | 30.4 | 32.1 | 31.4 |
| Hematopoietic and reticulo- (n) | 2,960 | 2,353 | 976 | 826 | 1,418 | 1,438 | 655 | 952 | 1,108 | 1,111 | 1,070 | 1,072 | 5,313 |
| endothelial system (%) | 51.6 | 50.4 | 40.4 | 50.6 | 55.8 | 54.7 | 55.6 | 48.6 | 52.9 | 52.9 | 51.7 | 49.3 | 51.1 |

(%) column percentage

Sex: Pearson chi2(2) = 3.32, p=0.190 Age: Pearson chi2(8) = 205.59, p<0.0001 Year: Pearson chi2(8) = 23.95, p=0.002

Haematological malignancies: distribution of morphology codes by sex, age group and year of diagnosis (n=10,399)

| Morphology code | Sex | | Age group in years | | | | | Year of diagnosis | | | | | overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,734 | 4,665 | 2,419 | 1,633 | 2,541 | 2,627 | 1,179 | 1,960 | 2,093 | 2,102 | 2,069 | 2,175 | 10,399 |
| Malignant lymphoma, NOS (n) | 149 | 149 | 22 | 34 | 54 | 97 | 91 | 54 | 50 | 69 | 58 | 67 | 298 |
| (%) | 2.6 | 3.2 | 0.9 | 2.1 | 2.1 | 3.7 | 7.7 | 2.8 | 2.4 | 3.3 | 2.8 | 3.1 | 2.9 |
| Hodgkin lymphoma (n) | 458 | 314 | 542 | 63 | 90 | 57 | 20 | 155 | 145 | 156 | 166 | 150 | 772 |
| (%) | 8.0 | 6.7 | 22.4 | 3.9 | 3.5 | 2.2 | 1.7 | 7.9 | 6.9 | 7.4 | 8.0 | 6.9 | 7.4 |
| Non-Hodgkin lymphoma (n) | 2,379 | 2,044 | 895 | 782 | 1,111 | 1,156 | 479 | 875 | 868 | 846 | 876 | 958 | 4,423 |
| (%) | 41.5 | 43.8 | 37.0 | 47.9 | 43.7 | 44.0 | 40.6 | 44.6 | 41.5 | 40.3 | 42.3 | 44.1 | 42.5 |
| Plasmacytoma (n) | 931 | 769 | 190 | 299 | 481 | 532 | 198 | 278 | 381 | 391 | 297 | 353 | 1,700 |
| (%) | 16.2 | 16.5 | 7.9 | 18.3 | 18.9 | 20.3 | 16.8 | 14.2 | 18.2 | 18.6 | 14.4 | 16.2 | 16.4 |
| Mastocytoma (n) | 19 | 7 | 12 | 5 | 5 | 3 | 1 | 6 | 4 | 6 | 2 | 8 | 26 |
| (%) | 0.3 | 0.2 | 0.5 | 0.3 | 0.2 | 0.1 | 0.1 | 0.3 | 0.2 | 0.3 | 0.1 | 0.4 | 0.3 |
| Immunoproliferative disease (n) | 91 | 78 | 16 | 18 | 56 | 49 | 30 | 32 | 36 | 45 | 33 | 23 | 169 |
| (%) | 1.6 | 1.7 | 0.7 | 1.1 | 2.2 | 1.9 | 2.5 | 1.6 | 1.7 | 2.1 | 1.6 | 1.1 | 1.6 |
| Leukemia (n) | 1,693 | 1,292 | 727 | 428 | 742 | 730 | 358 | 558 | 605 | 582 | 635 | 605 | 2,985 |
| (%) | 29.5 | 27.7 | 30.1 | 26.2 | 29.2 | 27.8 | 30.4 | 28.5 | 28.9 | 27.7 | 30.7 | 27.8 | 28.7 |
| Other, specified (n) | 14 | 12 | 15 | 4 | 2 | 3 | 2 | 2 | 4 | 7 | 2 | 11 | 26 |
| (%) | 0.2 | 0.3 | 0.6 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.3 | 0.1 | 0.5 | 0.3 |

(%) column percentage

Sex: Pearson chi2(7) = 18.54, p=0.010 Age: Pearson chi2(28) = 1.3e+03 , p<0.0001 Year: Pearson chi2(28) = 60.67, p<0.0001

Haematological malignancies: Method of 1st detection of tumour by sex, age group and year of diagnosis (n=10,399)

| **Detection** | **Sex** | | **Age goup in years** | | | | | **Year of diagnosis** | | | | | **Overall** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,734 | 4,665 | 2,419 | 1,633 | 2,541 | 2,627 | 1,179 | 1,960 | 2,093 | 2,102 | 2,069 | 2,175 | 10,399 |
| Symptoms (n) | 1,377 | 1,136 | 707 | 382 | 615 | 561 | 248 | 293 | 287 | 422 | 715 | 796 | 2,513 |
| (%) | 24.0 | 24.4 | 29.2 | 23.4 | 24.2 | 21.4 | 21.0 | 15.0 | 13.7 | 20.1 | 34.6 | 36.6 | 24.2 |
| Incidental (n) | 368 | 247 | 99 | 91 | 174 | 154 | 97 | 92 | 117 | 117 | 149 | 140 | 615 |
| (%) | 6.4 | 5.3 | 4.1 | 5.6 | 6.9 | 5.9 | 8.2 | 4.7 | 5.6 | 5.6 | 7.2 | 6.4 | 5.9 |
| Screening (n) | 35 | 25 | 3 | 13 | 22 | 15 | 7 | 8 | 8 | 10 | 15 | 19 | 60 |
| (%) | 0.6 | 0.5 | 0.1 | 0.8 | 0.9 | 0.6 | 0.6 | 0.4 | 0.4 | 0.5 | 0.7 | 0.9 | 0.6 |
| Other (n) | 24 | 32 | 4 | 4 | 7 | 16 | 25 | 4 | 8 | 6 | 16 | 22 | 56 |
| (%) | 0.4 | 0.7 | 0.2 | 0.2 | 0.3 | 0.6 | 2.1 | 0.2 | 0.4 | 0.3 | 0.8 | 1.0 | 0.5 |
| Unknown (n) | 3,930 | 3,225 | 1,606 | 1,143 | 1,723 | 1,881 | 802 | 1,563 | 1,673 | 1,547 | 1,174 | 1,198 | 7,155 |
| (%) | 68.5 | 69.1 | 66.4 | 70.0 | 67.8 | 71.6 | 68.0 | 79.7 | 79.9 | 73.6 | 56.7 | 55.1 | 68.8 |

(%) column percentage

Sex: Pearson chi2(4) = 9.40, p=0.052 Age: Pearson chi2(16) = 154.38, p<0.0001 Year: Pearson chi2(16) = 629.76, p<0.0001

Haematological malignancies: distribution of basis of diagnosis codes by sex, age group and year of diagnosis (n=10,399)

| Basis of diagnosis | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,734 | 4,665 | 2,419 | 1,633 | 2,541 | 2,627 | 1,179 | 1,960 | 2,093 | 2,102 | 2,069 | 2,175 | 10,399 |
| DCO (n) | 56 | 63 | 1 | 5 | 9 | 39 | 65 | 22 | 36 | 26 | 15 | 20 | 119 |
| (%) | 1.0 | 1.4 | 0.0 | 0.3 | 0.4 | 1.5 | 5.5 | 1.1 | 1.7 | 1.2 | 0.7 | 0.9 | 1.1 |
| Clinical (n) | 7 | 6 | 3 | - | 1 | 3 | 6 | 2 | - | - | 3 | 8 | 13 |
| (%) | 0.1 | 0.1 | 0.1 | - | 0.0 | 0.1 | 0.5 | 0.1 | - | - | 0.1 | 0.4 | 0.1 |
| Clinical investigation (n) | 22 | 18 | 3 | 2 | 4 | 18 | 13 | 9 | 4 | 8 | 5 | 14 | 40 |
| (%) | 0.4 | 0.4 | 0.1 | 0.1 | 0.2 | 0.7 | 1.1 | 0.5 | 0.2 | 0.4 | 0.2 | 0.6 | 0.4 |
| Tumour markers (n) | 23 | 23 | 1 | 2 | 3 | 17 | 23 | 6 | 12 | 6 | 10 | 12 | 46 |
| (%) | 0.4 | 0.5 | 0.0 | 0.1 | 0.1 | 0.7 | 2.0 | 0.3 | 0.6 | 0.3 | 0.5 | 0.6 | 0.4 |
| Cytology (n) | 605 | 529 | 90 | 121 | 268 | 356 | 299 | 187 | 243 | 209 | 253 | 242 | 1,134 |
| (%) | 10.6 | 11.3 | 3.7 | 7.4 | 10.6 | 13.6 | 25.4 | 9.5 | 11.6 | 9.9 | 12.2 | 11.1 | 10.9 |
| Histology of metastasis (n) | 22 | 10 | 7 | 3 | 9 | 11 | 2 | 3 | 6 | 2 | 13 | 8 | 32 |
| (%) | 0.4 | 0.2 | 0.3 | 0.2 | 0.4 | 0.4 | 0.2 | 0.2 | 0.3 | 0.1 | 0.6 | 0.4 | 0.3 |
| Histology of primary tumour (n) | 4,992 | 4,005 | 2,314 | 1,499 | 2,245 | 2,176 | 763 | 1,730 | 1,787 | 1,846 | 1,767 | 1,867 | 8,997 |
| (%) | 87.1 | 85.9 | 95.7 | 91.8 | 88.4 | 82.8 | 64.7 | 88.3 | 85.4 | 87.8 | 85.4 | 85.8 | 86.5 |
| Unknown (n) | 7 | 11 | - | 1 | 2 | 7 | 8 | 1 | 5 | 5 | 3 | 4 | 18 |
| (%) | 0.1 | 0.2 | - | 0.1 | 0.1 | 0.3 | 0.7 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 |

(%) column percentage

Sex: Pearson chi2(7) = 9.86, p=0.197 Age: Pearson chi2(28) = 883.28, p<0.0001 Year: Pearson chi2(28) = 62.67, p<0.0001

Haematological malignancies: distribution of histological grading codes by sex, age group and year of diagnosis (n=10,399)

| Grade | Sex | | Age group in years | | | | | Year of diagnosis | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | <55 | 55-64 | 65-74 | 75-84 | 85+ | 2008 | 2009 | 2010 | 2011 | 2012 | |
| Total (n) | 5,734 | 4,665 | 2,419 | 1,633 | 2,541 | 2,627 | 1,179 | 1,960 | 2,093 | 2,102 | 2,069 | 2,175 | 10,399 |
| Grade 1 (n) | 57 | 58 | 16 | 24 | 32 | 37 | 6 | 36 | 27 | 37 | 7 | 8 | 115 |
| (%) | 1.0 | 1.2 | 0.7 | 1.5 | 1.3 | 1.4 | 0.5 | 1.8 | 1.3 | 1.8 | 0.3 | 0.4 | 1.1 |
| Grade 2 (n) | 14 | 10 | 6 | 7 | 6 | 4 | 1 | 3 | 1 | 5 | 7 | 8 | 24 |
| (%) | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.3 | 0.4 | 0.2 |
| Grade 3 (n) | 108 | 76 | 34 | 32 | 38 | 51 | 29 | 53 | 62 | 59 | 4 | 6 | 184 |
| (%) | 1.9 | 1.6 | 1.4 | 2.0 | 1.5 | 1.9 | 2.5 | 2.7 | 3.0 | 2.8 | 0.2 | 0.3 | 1.8 |
| Grade X (n) | 6 | 1 | - | 3 | 1 | 2 | 1 | - | - | 3 | 1 | 3 | 7 |
| (%) | 0.1 | 0.0 | - | 0.2 | 0.0 | 0.1 | 0.1 | - | - | 0.1 | 0.1 | 0.1 | 0.1 |
| Unknown (n) | 5,549 | 4,520 | 2,363 | 1,567 | 2,464 | 2,533 | 1,142 | 1,868 | 2,003 | 1,998 | 2,050 | 2,150 | 10,069 |
| (%) | 96.8 | 96.9 | 97.7 | 96.0 | 97.0 | 96.4 | 96.9 | 95.3 | 95.7 | 95.1 | 99.1 | 98.9 | 96.8 |

(%) column percentage

Sex: Pearson chi2(4) = 5.13, p= 0.274 Age: Pearson chi2(16) = 29.88, p=0.019 Year: Pearson chi2(16) = 151.76, p<0.0001

## 7.4 Declaration of authorship

I hereby declare that I have written this project report on my own and without the use of documents and sources other than those stated above. I have mentioned all used sources and cited them correctly according to established academic citation rules.

Brütten, 23th February 2017

## 7.5 Curriculum vitae

**Personal:** Anka Baltensperger, female, Swiss citizen, living in 8311 Brütten, Switzerland. Married to Stefan Baltensperger, no children.

**Education:** Primary and secondary school, Switzerland (1983-1992)

Intermediate diploma school, Switzerland (1993-1996)

College of higher education as Biomedical Analyst, Switzerland (1996-1999)

Qualification for university entrance at the Thurgauisch- Schaffhauserische Maturitätsschule für Erwachsene, Switzerland (1999-2002)

Swiss diploma as Commercial Clerk (Handelsdiplom, 2001-2002)

Master of Arts (political science, Swiss constitutional law and international law), University of Zurich, Switzerland (2002-2007)

Project management, Department of Informatics, University of Zurich, Switzerland (2006-2006)

Web Publishing, IT training centre, City of Zurich, Switzerland (2008-2008)

Master of Public Health, Universities Basel, Bern and Zurich, Switzerland (2012-current)

**Experience:** Scientific Assistant (internship), Institute of General Practice and Health Services Research, University of Zurich, Switzerland (2012-2012)

Editorial Coordinator/Secretary, European Heart Journal, Switzerland (2009-2011)

Project Coordinator/Assistant, Police Department, City of Zurich, Switzerland (2008-2009)

Study Coordinator/Assistant, Medical Department, Hirslanden Private Hospital Group, Switzerland (2005-2008)

Administrator, payroll department, Tobias Juchler & Co., Switzerland (2004-2004)

Administrator, project management, Cervo Services PLC, Switzerland (2003-2004)

Administrator, tax & legal department, Swissvalor PLC, Switzerland (2003-2003)

Administrator, mortage department, Migros Bank Winterthur, Switzerland (2001-2002)

Biomedical analyst, St. Gallen Cantonal Hospital and Unilabs St. Gallen, Switzerland (1996-2001)

## 7.6 Timetable protocol

| Milestones (M), project steps | Date | Hours spent |
|---|---|---|
| ***M1: Submission project outline of master thesis to Direction of Studies of the MAS programme*** | ***24.04.2015*** | 32h |
| ***M2: Submission adaption of project outline of master thesis according to input of Direction of Studies of the MAS programme*** | ***08.06.2015*** | 3h |
| Study of the statistical methods to be applied and rough analysis phase | July 2015 to January 2016 | 62 |
| Meeting with thesis advisor to discuss phase I | 01.02.2016 | 1.5h |
| Detailed analysis of the data sample for one tumour site | February to March 2016 | 76h |
| Meeting with thesis advisor to discuss phase II | 11.04.2016 | 2h |
| Detailed analysis of the entire data sample for the remaining four tumour sites | April to August 2016 | 190h |
| Meeting with thesis advisor to discuss phase III | 03.08.2016 | 1.5h |
| Email exchange with thesis advisor to discuss occurring issues during phase I to III | over entire period | 4h |
| ***M3: Interpretation and discussion of the results*** | August to September 2016 | 50h |
| Writing of the report | September 2016 | 38h |
| ***M4: Submission of the master thesis*** | ***03.10.2016*** | Total: 460h |
| Revision of the master thesis according to the information provided after first assessment. | January to February 2017 | 65h |
| ***M5: Submission of revised version of the master thesis*** | ***23.02.2017*** | Total: 525h |